The Electrical Industry's Weekly Magazine

April 21, 1958

Electrical World

A McGraw-Hill Publication

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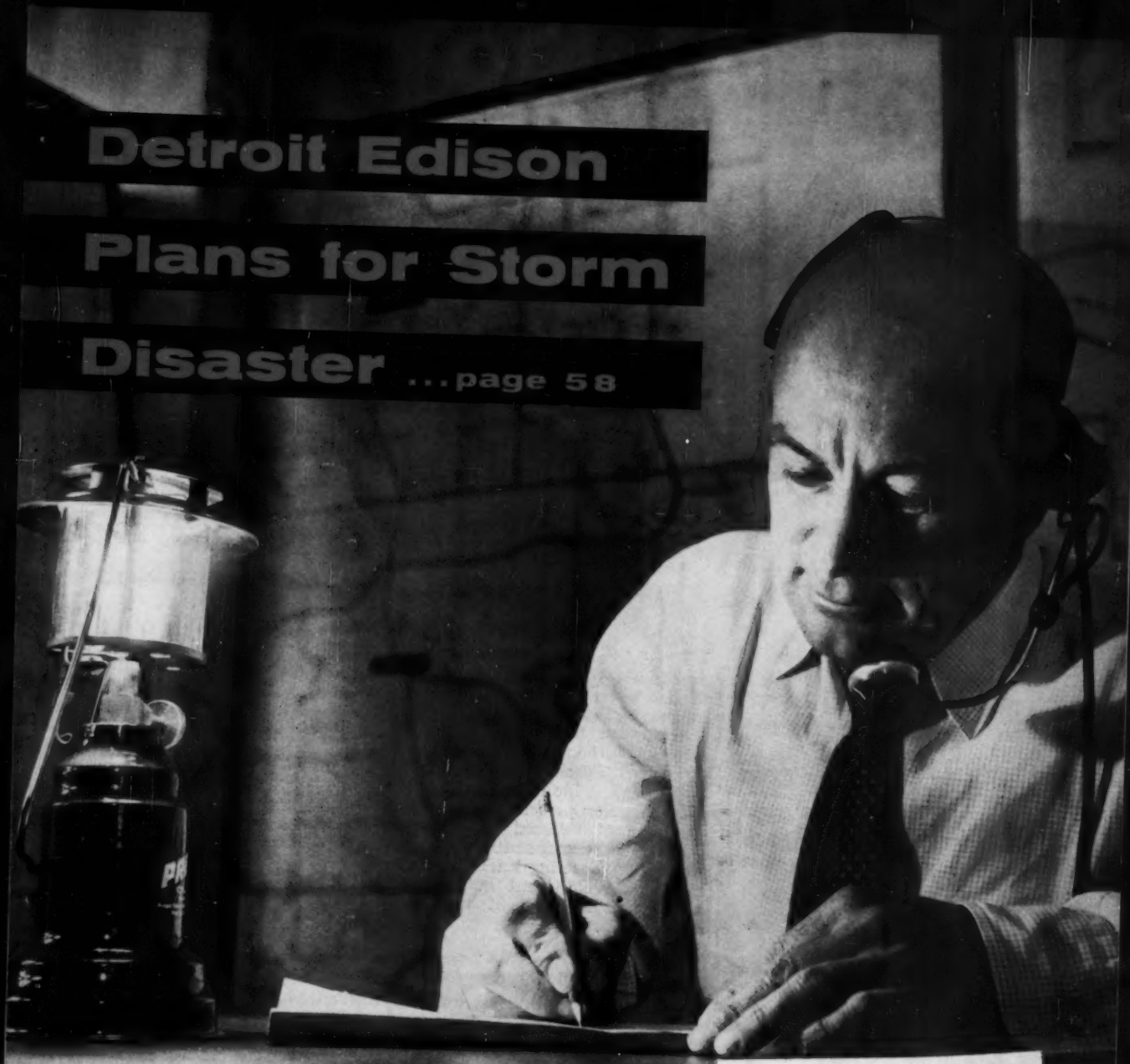

Detroit Edison Plans for Storm Disaster

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Electrical Business Outlook . . p 95

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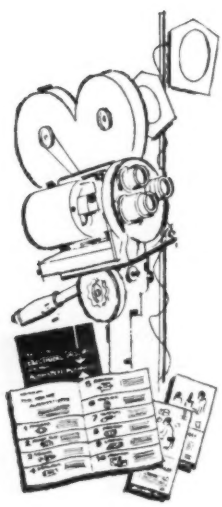

"Automating Electrically"—film package available now to help build load

MPA—More Power to America—now in its 14th year, is General Electric's continuing program of information and service to help speed industrial electrification. Newest addition to the MPA film series is "Automation and Mr. Halstead" which supplements G.E.'s earlier program, "This is Automation" released two years ago. It again demonstrates General Electric's pioneering leadership in market development activities which mutually benefit utilities and manufacturers.

Full-color motion picture and an authoritative 44-page manual entitled "The Impact of Electrical Progress on Your Automation Planning" are powerful new load-building tools. They are available for sale or loan to help power sales engineers dramatize these concepts to your industrial customers. Contact your local G-E Apparatus Sales Office for complete details or for a showing of the film. General Electric Company, Schenectady 5, New York. 301-381

Since 1945, 37 programs have been released of which 19 are in continuing, active demand as load-building tools

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 149, No. 16 APRIL 21, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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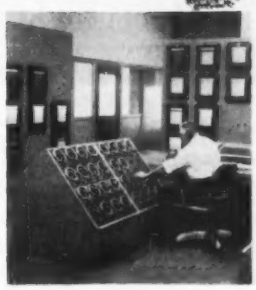

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A. B. Coyle, Line Material Industries

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New Precipitator Promises Better Efficiency

J. J. Trainor, Public Service Co of Indiana

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Detroit Edison Readies for Storm Disaster

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Let's Be Sensible About Public Relations

R. H. Sessions, Idaho Power Co

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West Penn's Dispatch Computer Proves Worth

W. H. Osterle, West Penn Power Co; R. B. Squires, Westinghouse Electric Corp

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Anderson's Newest Hot Line Stirrup Clamps: Series AAS and BBS

Twice as safe . . . twice as secure! Specially designed for use with aluminum (AAS series) or copper (BBS series) primaries. Safe because grippers are permanently attached to the bolt stems . . . can't slip or fall out! Secure because there are two—not one—complete high pressure, high strength clamp systems!

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Aiming At The Future

The twenty-fifth annual conference of the Southeastern Electric Exchange, held two weeks ago, was rated high for its program by most in attendance. Perhaps the mood of the papers could be described as "a realistic view of the future".

Some areas of industry prospects were covered in a very frank presentation by Tomlinson Fort of Westinghouse. We hope that certain predictions which he made for 1978 will not be passed over lightly, particularly in view of certain system troubles that are fresh in our minds.

Mr. Fort said, "The tremendous load growth of the utilities (by 1978) will be met by changes in the design and operation of our present utility systems. Higher secondary distribution voltages will be the rule for both residential and commercial customers. Residential . . . circuits will be underground . . ."

Unfortunately, if this prediction is to come true, the industry cannot wait until 1978 to complete the planning and execute the contracts. Now is the time for the industry committees and the company planning divisions to work out the system of the future. Statistics on the high cost of something that is probably inevitable will not solve any of the problems. All-out efforts to find the cheapest underground system seems to be the urgent need of the day. Then the question of who will pay for it can be resolved in each individual case.

Fischer Black

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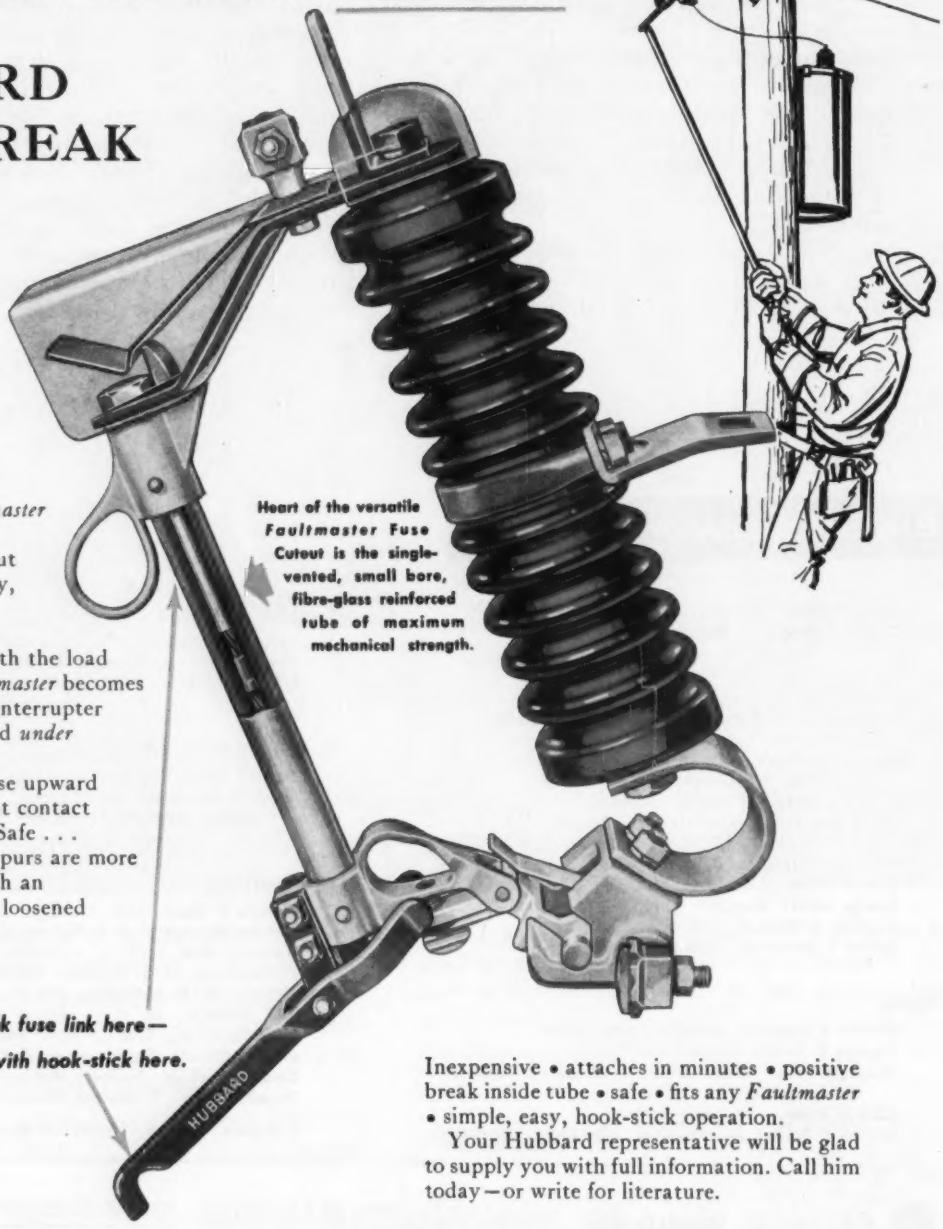
You can add the NEW Low-Cost

HUBBARD LOADBREAK LEVER



Yes! Now you can attach mechanical load break levers to any Hubbard *Faultmaster* Cutout regardless of whether they were put on the lines yesterday, last month, last year or years ago.

When equipped with the load break lever the *Faultmaster* becomes a safe, positive load interrupter *anywhere*, *anytime* and *under any rated load*.

Positive . . . because upward thrust maintains tight contact during interruption. Safe . . . because a lineman's spurs are more deeply embedded with an upthrust rather than loosened by a downward pull.

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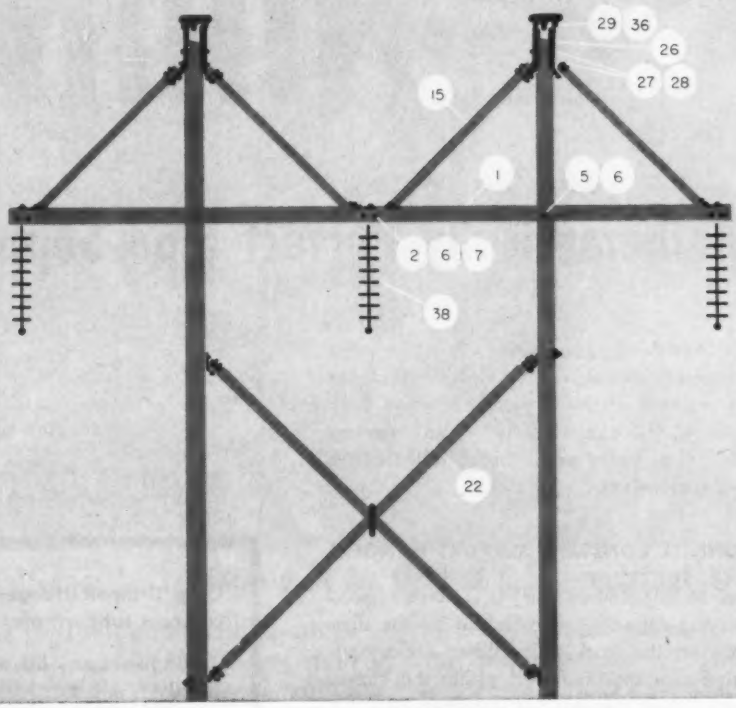
DRG. REF. #	QUANTITY	DESCRIPTION	DRG. REF. #	QUANTITY	DESCRIPTION
792	2	Pole	15	4	Vee brace 3⅜" x 4⅜" cross section
1	2	Crossarm	22	1 set	Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers
2	3	Steel spacer fitting w/mounting bolts	26	2	Static wire support
5	2	Stud bolt ⅞" w/washer nuts	27	4	Machine bolt ¾"
6	8	MF locknut ⅞"	28	4	MF locknut ¾"
7	1	Bent stud bolt ⅞" x 8" w/2 sq. nuts	29	2	Clevis
7	2	Bent bolt ⅞" x 5½" w/sq. nut	36	2	Suspension clamp for static wire
			38	As required	Suspension insulators and fittings



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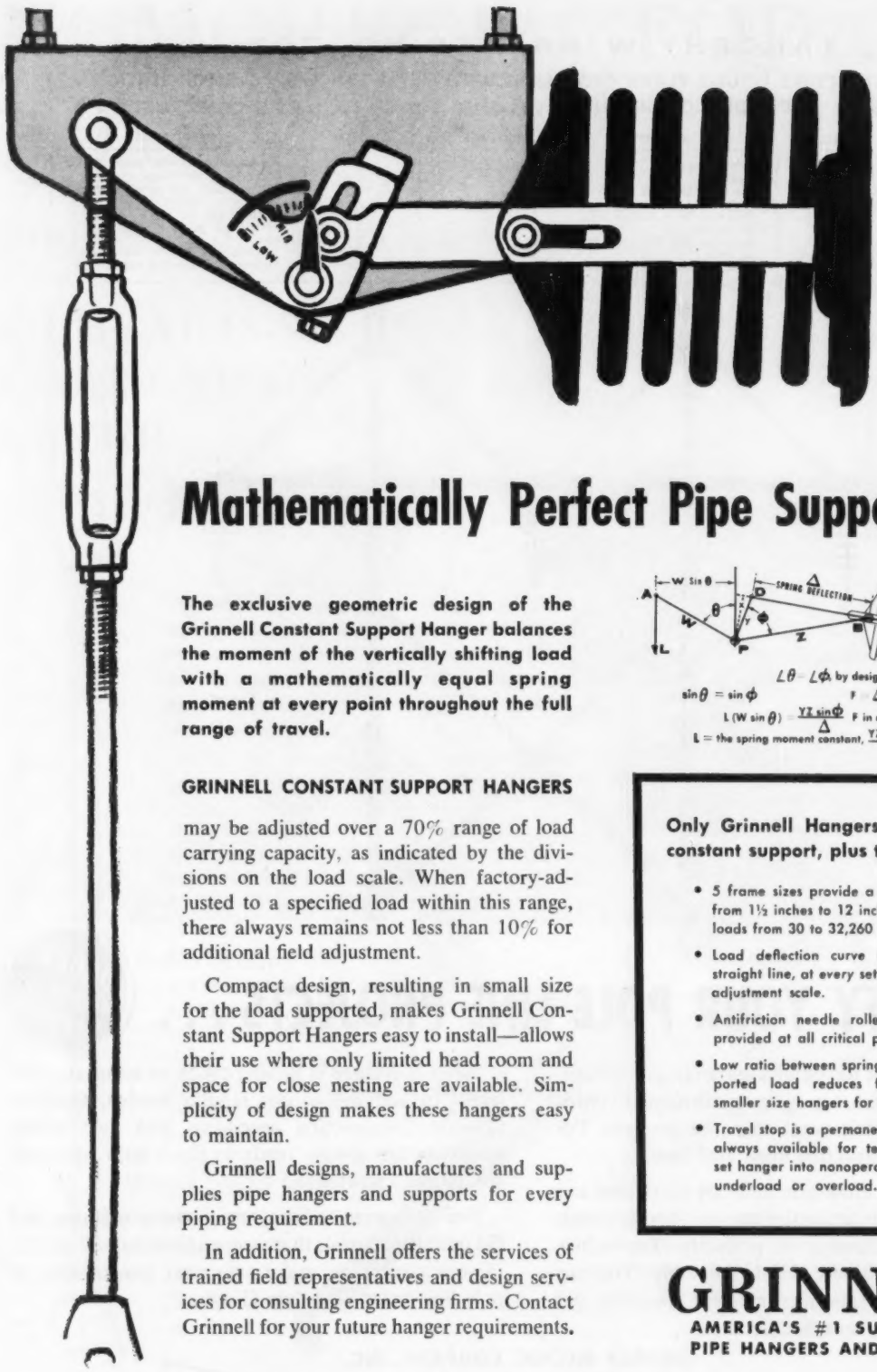
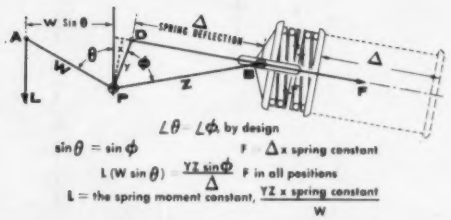


Mathematically Perfect Pipe Support!

The exclusive geometric design of the Grinnell Constant Support Hanger balances the moment of the vertically shifting load with a mathematically equal spring moment at every point throughout the full range of travel.



$\angle\theta = \angle\phi$ by design

$\sin\theta = \sin\phi$ $\quad F = \Delta \times$ spring constant

$L\,(W \sin\theta) = \frac{YZ \sin\Phi}{\Delta}$ F in all positions

L = the spring moment constant, $\frac{YZ \times \text{spring constant}}{W}$

GRINNELL CONSTANT SUPPORT HANGERS may be adjusted over a 70% range of load carrying capacity, as indicated by the divisions on the load scale. When factory-adjusted to a specified load within this range, there always remains not less than 10% for additional field adjustment.

Compact design, resulting in small size for the load supported, makes Grinnell Constant Support Hangers easy to install—allows their use where only limited head room and space for close nesting are available. Simplicity of design makes these hangers easy to maintain.

Grinnell designs, manufactures and supplies pipe hangers and supports for every piping requirement.

In addition, Grinnell offers the services of trained field representatives and design services for consulting engineering firms. Contact Grinnell for your future hanger requirements.

Only Grinnell Hangers provide true constant support, plus these features:

- 5 frame sizes provide a range of travel from 1½ inches to 12 inches and support loads from 30 to 32,260 pounds.
- Load deflection curve is a horizontal straight line, at *every* setting on the load adjustment scale.
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- Low ratio between spring force and supported load reduces friction, permits smaller size hangers for loads carried.
- Travel stop is a permanent attachment — always available for temporary use to set hanger into nonoperative position for underload or overload.

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Compared to the present leading competitive general-purpose oil-resistant, ozone-resistant rubber, Paracril® OZO vulcanizates show *marked superiority* in resistance to oil, fuel and weathering (ozone) and in color retention, abrasion resistance and low moisture absorption. In tensile strength, flame resistance and cost of complete compound, both are essentially the same.

Thus Paracril OZO provides a unique combination of properties far in excess of ordinary nitrile rubber!

But Paracril OZO is no ordinary nitrile rubber! It is a modified Paracril which incorporates the compounding discoveries of Naugatuck research chemists to which reference has been made in recent Paracril advertisements. The chief modifier is one of Naugatuck's Marvinol® vinyl resins, and the product includes excellent stabilizers for both vinyl and rubber.

Paracril OZO is supplied in the form of small, light-colored flakes, permitting easy handling and considerable flexibility in processing methods.

A most important feature of Paracril OZO is that the vinyl resin in it is completely fluxed during its manufacture. This not only eliminates a difficult compounding procedure on the part of the user but also assures full development of the added properties imparted by the vinyl modifier.

Its unique properties particularly recommend Paracril OZO for wire jackets, shoe soles, coated fabrics, automotive parts, hose and belting jackets. Write for Bulletin No. 219 which contains compounding suggestions and interesting test data on Paracril OZO vulcanizates.

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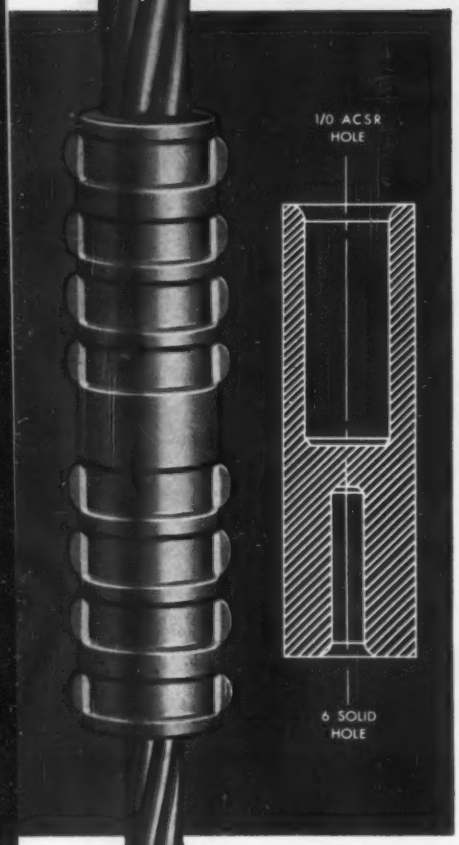

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GREATER CONTACT AREA

where needed

Hole Depth Increases With Size of Conductor... thereby providing more contact area for the conductors being connected.

COLOR CODE	WIRE SIZE ACSR	WIRE SIZE AWG	HOLE DEPTH IN INCHES
Brown	–	8 sol — 10 str	.820
Green	–	6 sol — 8 str	.840
Blue	6	4 sol — 6 str	.860
Orange	4	2 sol — 4 str	.925
Red	2	1 sol — 2 str	1.010
Yellow	1/o	1/o str	1.185

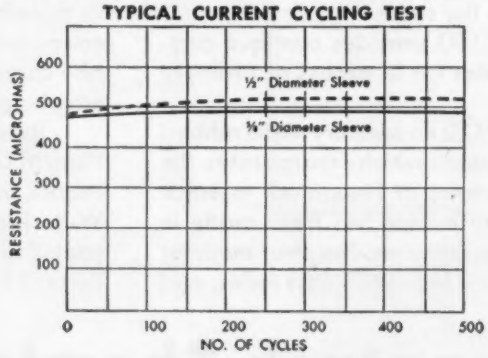
The center stop in a Blackburn Sleeve is a solid barrier that assures proper distribution of the inhibitor around the conductors.

FIRST! Printed (not indented) permanent COLOR CODING is *easier to read*—makes size identification positive and quick.

FIRST! Aluminum Sensitized Tape seals the Blackburn Sleeve's ends. Easy to puncture... and, if a particle of the seal is pushed into the chamber, it is conductive.

FIRST! Each Blackburn Sleeve contains the superior Blackburn inhibitor, Contax, *in measured amount.* Won't squirt out on glove or in face.

Conductivity of Connection PROVED GREATER Than Equivalent Length of The Conductors Being Connected.



A series of typical current cycling tests were conducted with both ½" x ⅜" diameter BLACKBURN Sleeves. Note the lower resistance of Blackburn Sleeves as compared to the equivalent length of cable without any sleeve.

Test Conditions

Wire: 2 ACSR to 4 stranded copper
Current: 190 Amperes
Cycle: 2 Hrs. "On" 1 Hr. "Off"
Length of Connection: 24 inches
Curves represent an average of five tests
Resistance of equivalent length of wire: 527 Microhms

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The Electrical Newsletter

FUTURE NEWS ▶ **Electric insect catchers will grow in importance.** Big boost for device came when Long Island farmers sued U.S. for damages allegedly resulting from mass spraying of DDT to control gypsy moths.

Private development of A-power may suffer a setback, fear some AEC officials. If JCAE succeeds in cutting AEC's proposed credit allowance of $30/gram for plutonium produced in reactors to near $12 favored by Democrats, utilities may reconsider building reactors. Result would be victory for federal reactor program backers.

Hearings on a plan to create Columbia River Corp in the Northwest may be held by Senate Public Works subcommittee in May. CRC would operate federal water projects in a four-state area.

LATE NEWS ▶ **Normal operations resume** at GE's large steam turbine plant, Schenectady. Dispute with Local 301, IUEW, over a job operation idled some 4,000 production workers for days; will be arbitrated.

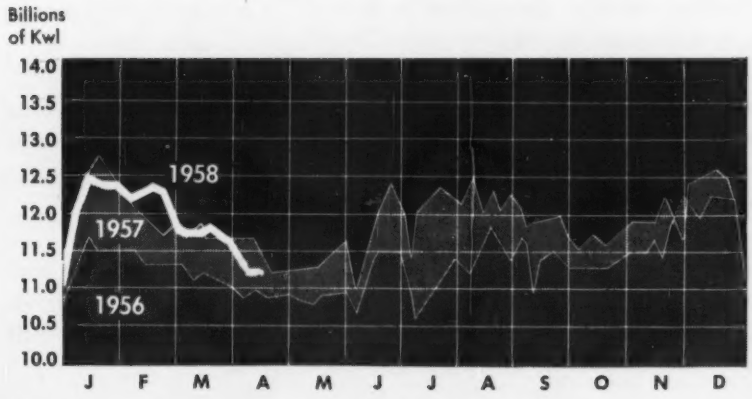
Interstate Power will spend about $51 million for construction in 1959-63, Pres M. L. Kapp tells N. Y. Security Analysts. Earnings per share total $1.05 for 12 mos. ended March, vs $1.01 for 1957.

End of 51-day strike at Kyger Creek plant came last week as UWUA Local 430 accepted, 160-16, terms of its first pact with OVEC. Terms: A 5% raise, with 2% effective May 1; remainder Sept. 1 under a pact to run to Sept. 1, 1959.

Reddy Kilowatt moves to 750 Third Ave, New York 17, on May 12.

Management changes . . . Louisville G&E's new VP's are A. G. Rosenbaum, A. J. Kieffer, and W. I. Lukenbill . . . C. E. Cannon becomes chief engineer at Washington Water Power . . . Duquesne Light names J. S. Brown, chief engineer, engineering and construction.

POWER OUTPUT—Down 3.3% (Week ending April 12), Kwhr 11,307,000,000



Per Cent Change From Previous Year

	Mar. 29	April 5	April 12
Total U.S.	+0.4	−3.1	−3.3
New Eng.	+2.4	−2.1	+0.6
Mid. Atlantic ..	+0.2	−2.9	−2.5
Cent. Ind.	−4.2	−8.1	−6.0
West Cent.	+1.3	−1.3	−1.0
Southeast	+2.6	−0.3	−1.2
South Cent.	+1.5	−1.6	+0.2
Rocky Mount..	−1.3	−0.8	−0.7
Pacific			
NW	−1.0	+0.1	−6.4
SW	−1.4	−2.1	−7.5

Seasonally Adjusted Index 222.7

Week Ago 222.2 Year Ago 230.6

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World Estimate). Excluding AEC, output decrease was 2.7%.

EVENTS ▶ **REA makes a policy switch to back the big appliance loan program** urged by President Eisenhower to help combat the recession. The move renews questions by power companies as to whether the loans come within the original intent of the REA act (p 48).

Meanwhile, the REA program reached the five-million consumer mark within the fortnight (p 49).

MANAGEMENT ▶ **Capital investment will take a 12% dip this year,** according to McGraw-Hill's latest survey of the spending plans of U. S. industry. Only industries in the entire economy that intend to boost capital outlays over 1957 are utilities (up 7%) and electrical manufacturers (up 4%). All other industries are cutting back, several by as much as 30% or 40%. The reason: idle capacity. But research spending continues to boom—laying the groundwork for big capital expenditures in the future (p 95).

Tempestuous gals like Carol and Edna no longer worry Detroit Ed. Because, inspired by memories of these destructive 1954 hurricanes, the utility has set up and tested a comprehensive disaster plan which can go into operation at first storm warnings. The plan, spelled out in a 432-page manual, aims at keeping service as routine and orderly as possible. It provides for setting up 51 self-sufficient zones and importing line crews, among other things (p 58).

GENERATION ▶ **An electrostatic precipitator promising better boiler efficiency** is slated for installation at PS of Indiana's New Albany station. Design of the newly developed dust collector enables power plant engineers to transfer more heat from stack gases to incoming combustion air. Collecting efficiency of 98.5% is expected when the new unit is combined with mechanical collectors (p 60).

West Penn's economic dispatch computer is chalking up big savings and meeting design expectations after only a little more than a year's operation. At present annual savings are about $50,000, with promises of future economies in dispatching the 1,500-Mw system. EDC's availability record is also good—less than 0.7% average forced-outage time in 8 months (p 55).

How can you avoid load-shedding complexities on large units? One solution is a scheme which calls for dividing an auxiliary power system into four bus sections. The process is described by a Commonwealth Ed engineer on p 62.

An annunciator system with plug-in elements will be introduced into the utility world this year when Public Service E&G installs one in its new Bergen Station. The system, which has no moving parts, will monitor 560 critical quantities in the plant (p 62).

DISTRIBUTION ▶ **Can you afford old transformers?** It may just be false economy to repair workable but old units when a program of planned transformer retirement can bring you savings and more efficient operation. Before spending any more money on pre-1940 models, why not check their characteristics against those of today's improved models **(p 68).**

MEETING ▶ **What are the prospects for energy from deuterium?** Delegates to the recent Southwest Electric Conference catch up on progress in this field and learn of the future of this isotope of hydrogen. The meeting also featured discussions on the advanced epithermal thorium reactor now being studied by Southwest Atomic Energy Associates **(p 112).**

INDUSTRIAL ▶ **A Philadelphia firm finds that electric heaters are a boon** to their plating and brazing operations. The compact, thermostatically controlled units have increased production efficiency and help to produce a higher quality product . . . Electric heat gives the sun a helping hand in the latter's traditional role—drying grass seed. With electric heat on the job, drying time has been cut sharply **(p 106).**

SELLING ▶ **There's been a boom in bagged bulb sales in Illinois.** Residents in CIPS' area recently bought 34,867 bags of six light bulbs each as a result of a successful campaign by the utility. Actual selling was done by community groups, which in turn reaped benefits . . . In an unusual program of selling electrical living to students, Indianapolis P&L exchanges new appliances for old at no charge to the schools **(p 102).**

MANUFACTURING ▶ **Third U.S. firm to enter the protective relay field** is Federal Pacific Electric, which expects to put the device on the market within 3 months . . . De Laval Steam Turbine supplies three barrel-type boiler feed pumps for Commonwealth Ed's Fisk station as part of the new 305-Mw turbine-generator's auxiliary equipment **(p 76)** . . . GE's newly designed transistorized carrier current equipment will be hitting the market soon **(p 80).**

NEW EQUIPMENT ▶ **A new metal-clad 1,000-Mva, 13.8 magnetic air circuit breaker** offers 35% greater interrupting capacity than the next lower rating of its type. The compact unit, with only a 4-in. increase in depth and none in height or width, is designed mainly for protecting distribution circuits in large metropolitan substations . . . An aluminum neutral connector now available for use with triplex secondaries and service drops features a combination of mechanical and electrical connections in a single unit . . . A new scaffold of lightweight aluminum alloy is designed for use on towers for transmission lines **(p 86).**

PEOPLE ▶ **Elmer H. Lother becomes new VP-comptroller** of New England Power Service Co . . . At Western Colorado Power, L. J. Baudino rises to VP-general manager . . . NEMA elects J. R. MacDonald treasurer . . . N. J. MacDonald heads National Electrical Week **(p 108).**

Management expects the young engineers they hire to: 1. be acquainted with production costs; 2. be aware of the basic financial transactions of the company; 3. know the company's organizational structure; and 4. know what is required of the engineer so that high-level decision-making processes can function. This is what the author of a recently published book entitled, **"Management for Engineers"**, thinks companies want from the young engineer. His book should go a long way in assisting the engineer to meet these requirements. The author describes the corporate life of a mythical business firm, the A. Z. Zalk Equipment Co, to present his material. Chapter headings include: legal forms, money flow, profits, production costs, interest and time, and depreciation. Because of the complete coverage the individual subjects are not treated deeply. The utility engineer who uses the book must also remember the financial peculiarities of a regulated industry. But as an introduction to management the average young engineer should find it useful.—**Management for Engineers. By R. C. Heimer. Published by McGraw-Hill Book Co. 330 W. 42nd St., New York 36, N. Y. 312 pages. Price $6.75.**

Because many public utility operations are regulated there is no reason why regulation should not be extended to labor relations if a breakdown in the employer-employee relationship threatens to cut off an indispensable service.—**Edward Sussna, Public Utilities Fortnightly, March 27, 1958.**

TECHNICAL NOTES

Plastic coating permanently protects wood against decay, claims Society of the Plastics Industry. Not only does the plastic keep out decay fungi but kiln drying before coating leaves the interior sterile.

Actual operating experience indicates that the probability of the coincidence of a major outage with a monthly peak day is relatively small.

FROM EDITORS IN THE FIELD

Fire hazard and faulty operation are threatened when iron wire extension cord is used to serve such appliances as window air conditioners. Losses in the cord reach 225 watt at 12-amp loading. Such extension cords have been used according to findings of Valley Public Power & Irrigation District, North Platte, Nebraska.

GATE HOUSE at entrance to Indian Lake Estates, country club community, with the professionally styled L-M Ovalite (Line 2A) mercury vapor luminaires mounted on double upsweep arms to light the dual-lane avenues. These provide uniform illumination of 4.2 footcandles on the roadways. Lights are turned on and off automatically by L-M photoelectric relays.

L-M Luminaires Light Florida's Beautiful Indian Lake Estates

High in the lake and ridge section of Florida, in the area around Lake Wales, is located a new private city, Indian Lake Estates. This is a multi-million dollar development, an exclusive country club community, providing exceptional beauty and outstanding recreational facilities for residents.

Lighting the palm-lined, dual-lane avenues are L-M Ovalite (Line 2A) mercury vapor luminaires. These luminaires, mounted on metal poles at 30 feet, have dual 8-foot upsweep arms. They carry 20,000 lumen lamps and provide uniform illumination of 4.2 footcandles on the roadways. Underground 240-volt wiring serves the luminaires, which are controlled by photoelectric relays.

In addition, a 1,100-foot private pier is lighted with L-M's famous Suburbanaire (Line 2B) open type units containing 175-watt mercury lamps and ballast. They are spaced at approximately 100-foot intervals along the pier and provide 2.0 footcandles of illumination.

Ovalite An Efficient Light Source

The Line 2A luminaires have a high coefficient of utilization. Additional advantages include: choice of Type II, III, or IV light distribution patterns, by simply changing lamps or socket settings; many features for safety and easy servicing, including L-M's exclusive "service-safe" socket; choice of series or multiple service.

Get Complete Information

L-M provides a complete, highly styled lighting line of incandescent, mercury vapor, and fluorescent units, with excellent application engineering help for utilities, municipalities, consultants and subdividers. Ask the L-M Field Engineer or Lighting Engineer about L-M outdoor lighting equipment. Or write Line Material Industries, Milwaukee 1, Wis. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

McGRAW-EDISON

331-R

LINE MATERIAL Industries Outdoor Lighting

McGRAW-EDISON COMPANY

L-M's "HDO" open-type cutouts provide greater system reliability. The bird-proof design, rugged construction, and high interrupting capacity built into the cutout assure long, trouble-free service.

How L-M "HDO" Open-Type Cutouts Handle Both High and Low Faults

L-M's controlled double-venting principle provides positive pressure control—an outstanding advance in fuse cutout design.

by **M. L. FENNIG**
Sales Application Engineer,
Protective Equipment,
Line Material Industries

Fuse cutout design has always been something of a compromise. To assure expulsion of arcs from low-amperage faults, the tube must provide small volume to build ample pressure. Yet this same tube is subject to sudden rupture from the rapid development of large gas volumes from high-amperage arcs. L-M's controlled double-venting principle provides the best solution to this problem known at the present time.

Positive Pressure Control

A unique feature of L-M's "HDO" cutout is the pressure-controlled double-venting cap. On low-amperage faults, gases are vented from the bottom of the tube only. This allows sufficient pressure to build up in the tube to assure consistent, reliable arc interruption of faults of the smallest magnitude.

On high-amperage faults, where pressure relief is needed, the diaphragm in the heavy-duty cap opens at the top to allow double venting. The double venting reduces the stress on the cutout, eliminating the possibility of bursting the tube on high-amperage faults. This assures dependable operation, and greater safety for the lineman. Gases from the top are vented vertically to avoid gases from the bottom. This minimizes possibility of contact flashover.

L-M's "HDO" cutouts are strong, durable and easy to operate. They provide the greatest system reliability and lowest operating and maintenance cost of any cutout on the market today. Here's why.

Lower Resistance Path

All current-carrying parts are made of heavy-duty solid copper or copper alloy and are silver-plated to assure cool operation even after many years of service. In addition, the "HDO" has a minimum number of current-interchange points in the circuit, from line lead to the load lead. This provides ample capacity without overheating for years to come.

Greater Resistance to Corrosion

L-M uses high-strength, low-alloy corrosion-resistant steel, such as Cor-Ten, for all non-current-carrying parts, except the hanger. Cor-Ten steel has a yield point at least 1½ times that of structural steel and about twice that of mild carbon steel. Its ability to withstand atmospheric corrosion is 4 to 6 times greater than mild steel.

The results of a 16-year test, shown in the curves, prove the superior corrosion resistance of the low-alloy corrosion-resistant steel hardware furnished with L-M's "HDO" cutout.

Other Outstanding Features

- The "HDO" offers many other desirable features:
- Top contacts and center hanger mounting have through-bolts with insulated heads to provide complete bird-proof protection.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY

Distribution Class
Single Insulator Type

L-M's standard mounting "HDO" cutouts are rugged, easy to operate with hook-stick. All current-carrying parts are silver-plated to assure cool operation.

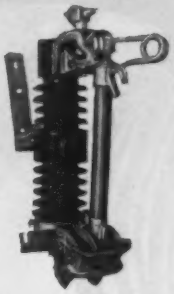
Two Insulator Type

Distribution post insulator mounting of L-M's "HDO" cutouts provides additional creepage distance for applications in industrial and coastal areas.

Complete Line of Open-Type Cutouts from 5.2 kv to 27 kv

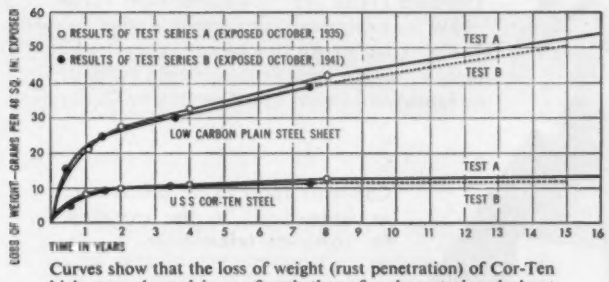
Power Class

Substation mounting is also available. L-M's "HDO" cutouts provide high interrupting capacity, economical fuse replacement, easy operation with a hook-stick and long life.



Load Break

Easy pulling action of interchangeable load-break cartridge will break the link. Arc interruption is completed inside the tube, assuring fast, safe switching of either inductive or capacitive load currents. Available in 5.2, 7.8, 15 and 27 kv ratings.



Curves show that the loss of weight (rust penetration) of Cor-Ten high strength steel is one-fourth that of carbon steel and about one-third that of copper steel after 16 years exposure to *severe* industrial atmospheric conditions. Steel of this type is used for all non-current-carrying parts of the "HDO" except the hanger.

COR-TEN is a registered trademark of U. S. Steel Co.

SIZES AND RATINGS

Cartridges	Interrupting Capacities, Amperes 5.2 KV	7.8 KV	15 KV	27 KV
Normal-Duty Single Venting (Solid Cap)	3000 A.	3000 A.	2000 A.	1200 A.
Heavy-Duty Double Venting (Heavy-Duty Cap)	6000	6000	4000	4000
Heavy-Duty Single Venting (Solid Cap)	5000	5000	4000	
Extra-Heavy-Duty Double Venting (Heavy-Duty Cap)	10000	10000	8000	

• All cartridges are designed for easy hook-stick removal and replacement.

• Top contacts are husky, hard-drawn copper, silver-plated. They serve as guides so the tube cannot miss top contacts.

• Cartridge is firmly anchored; the tube cannot move upward, even when it is accidentally closed in on a fault, within its rating.

• Cutout interrupts any fault current, from minimum melting of link to maximum interrupting capacity of cutout, *with any size link.*

Complete Line of Cutouts

L-M offers a complete line of cutouts in 5.2, 7.8, 15 and 27 kv classes, with a full line of fuse cartridges in normal, heavy, and extra heavy-duty interrupting rating, switch blade, and interchangeable load-break cartridges. All cartridges (except the 27 kv) use standard 20-inch distribution fuse links.

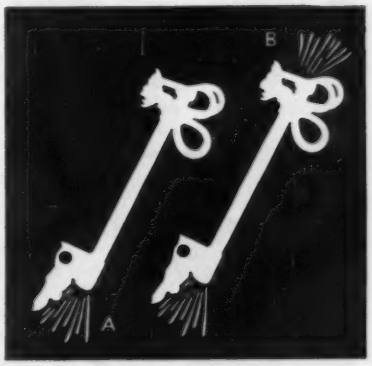
Interchangeable Load-Break Cartridge

Line Material's "HDO" open-type cutout has optional interchangeable load-break cartridges available in each voltage class and interrupting rating.

A pulling force of less than 30 pounds is required to break the largest size link. The cartridge is designed to interrupt all capacitive and inductive loads up through 100 amperes and to completely extinguish the load current in the tube. With L-M's simple load-break device you can switch loads or sectionalize distribution circuits quickly and easily with very little increase in your cutout investment.

Get Complete Information

Ask the L-M Field Engineer for bulletins and complete information about L-M's full line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



How Double Venting Controls Pressure

On low-amperage faults, ample pressure is provided to insure fast arc extinction, by single venting at the bottom of tube, *A*.

On high-amperage faults, heavy-duty cap at top (*B*) opens so that pressure is vented at both top and bottom of tube, providing greater safety by eliminating tube rupture. Note that the gases from the top are vented vertically—not horizontally. This eliminates danger of contact flashover.

fuse cutouts and fuse links

McGRAW EDISON

O.Z. pull boxes

SAVE TIME! SAVE SPACE! SAVE MONEY!

The easiest, most economical way to speed installation of conduit—of any size from ½" to 6"—is to use O. Z. Pull Boxes. Two hot dip galvanized malleable iron units fitted to an oversize length of pipe replace the conventional, bulky and costly pull box . . . cuts labor time in half!

O. Z. Pull Boxes are available in four designs: standard (Type "PB"); weather-tight (Type "PBW"); explosion proof and thin wall conduit. The oversize sleeve can be cut to required length "on the job" from standard conduit, or furnished to your specifications by O. Z.

Call your local O. Z. distributor, or write direct to the company for complete information.

1. Slide head "A" with sleeve over the conduit end. Attach head "B" on opposite conduit.

TYPE "PBW"

2. Simply pull cables, loop and feed back into oversize sleeve. Slide head "A" with sleeve into position and screw sleeve into head "B". Tighten set screws to lock "A" in position.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GArfield 1-7846

CAST IRON BOXES
CABLE TERMINATORS
POWER CONNECTORS
SOLDERLESS CONNECTORS
GROUNDING DEVICES
CONDUIT FITTINGS

You can replace *any* draw-lead bushing on your 69 kv system

with one of these LAPP POC* BUSHINGS!

Here's a real saving for you in simplification of warehouse inventories and reduction of costs! No matter how many types of transformers may be on your system . . . no matter how old they may be . . . any bushing replacement requirement can be met by the Lapp POC* ASA Standard bushing.

At 69 kv, for example, the Lapp POC* draw-lead (400 amp) bushing is made in just three shank lengths. Present transformer designs call for these bushings. On any older transformer using a pre-standard bushing, one of these will also fit perfectly; all that is required is a simple flange adapter which provides for differences in mounting details, and for length and clearances.

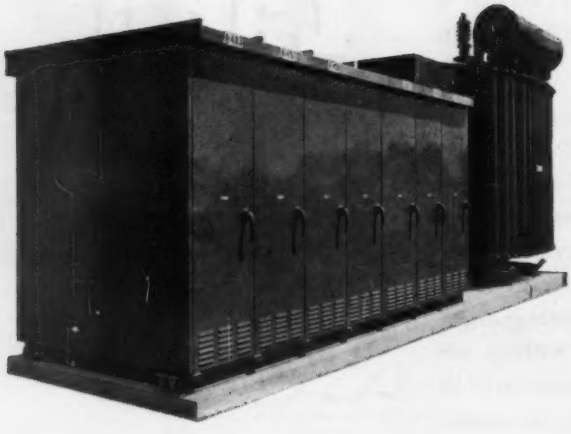
Lapp can supply POC* Bushings for your stand-by stocks in voltage ratings 15 kv to 161 kv. Also, we'll design and supply, at nominal cost, non-magnetic flange adapters which will adapt these ASA Standard bushings to every transformer on your system. Give us data on the transformer bushings you now have in service. Let us show you the economies you can effect by reducing your entire stock of spare bushings to the required sizes of Lapp POC* Bushings and a suitable assortment of flange adapters. You'll never be without the replacement bushing you need, and you will save spectacularly in warehouse space . . . in stock maintenance labor costs . . . in investment in inventory. Lapp Insulator Co., Inc., Le Roy, New York.

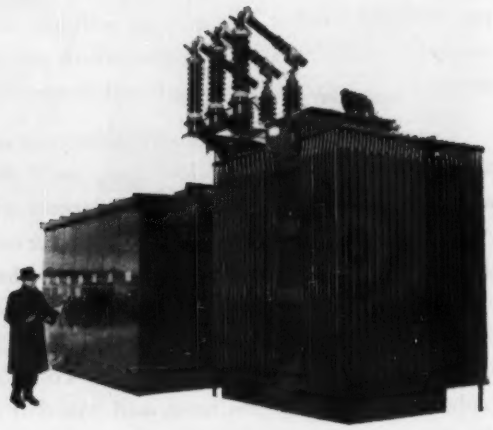
Lapp

POC* BUSHING

*PAPER-OIL CONDENSER TYPE
TOTALLY-ENCLOSED CORE
ASA STANDARD

PRIMARY UNIT SUBSTATIONS



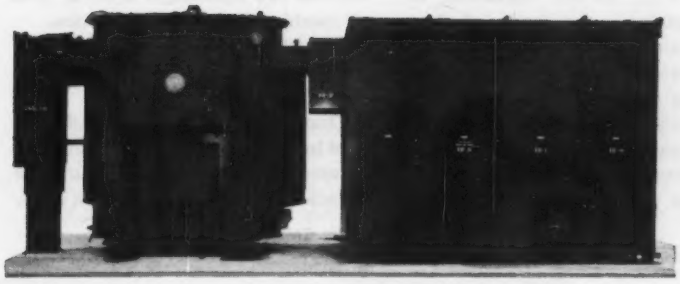


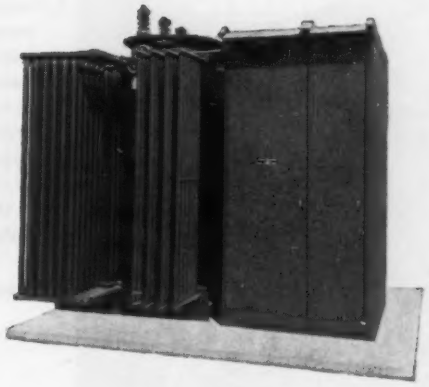
Winning Value Recognition All Over the Map

Look around you today. You will see more I-T-E PRIMARY UNIT SUBSTATIONS going into service everywhere—in places where orders are placed after careful evaluation of several different makes. The growing trend toward I-T-E substations reflects the response of shrewd buyers to I-T-E's standing policy of giving more value for no more money. I-T-E engineers work with you in the planning stage . . . custom design the station to meet your particular requirements . . . skillfully arrange I-T-E's quality components into an efficient unit that gives you the maximum value for the minimum investment . . . make deliveries to meet your construction schedules. Make I-T-E your dependable, single source for complete PRIMARY UNIT SUBSTATIONS.

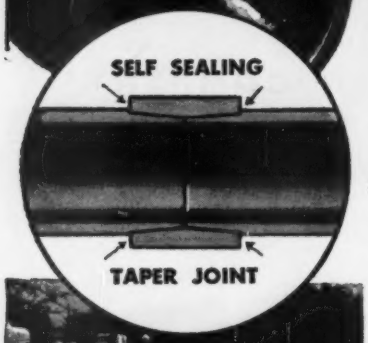
For information, write I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada, Eastern Power Devices Ltd., Port Credit, Ontario.

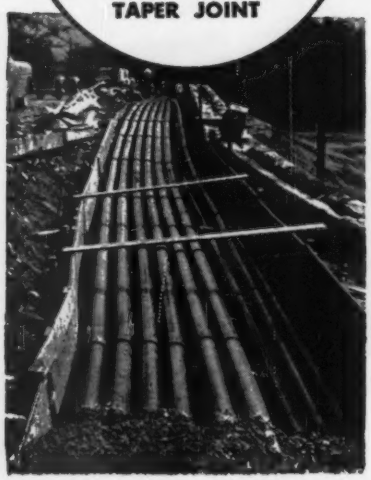
I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA





SMOOTH BORE!





Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

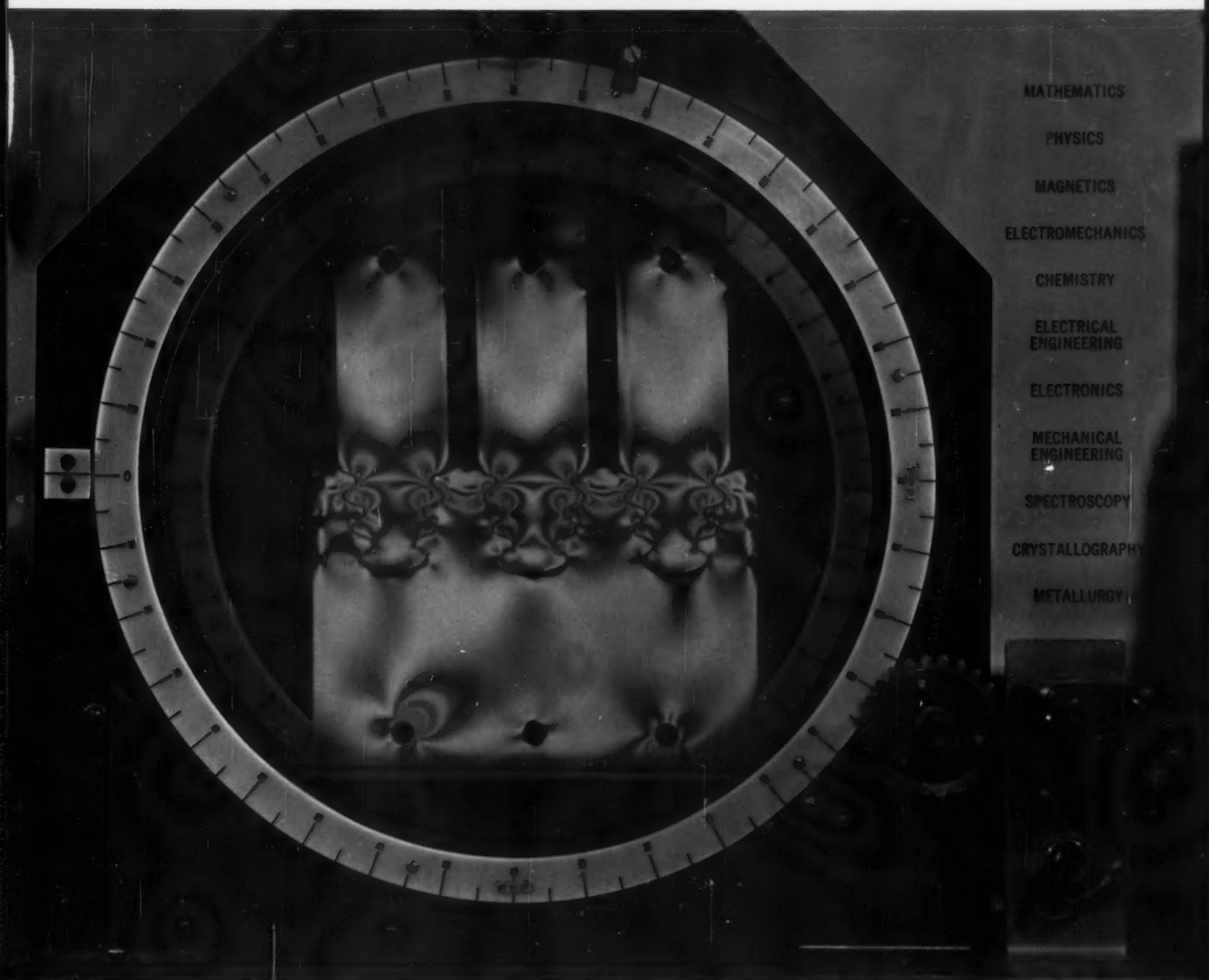
Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW-48A FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT



Photoelastic Test—Inside story of stresses on turbine blades

The entire industry benefits from Westinghouse plowback of earnings

RESEARCH CREATES BREAKTHROUGHS

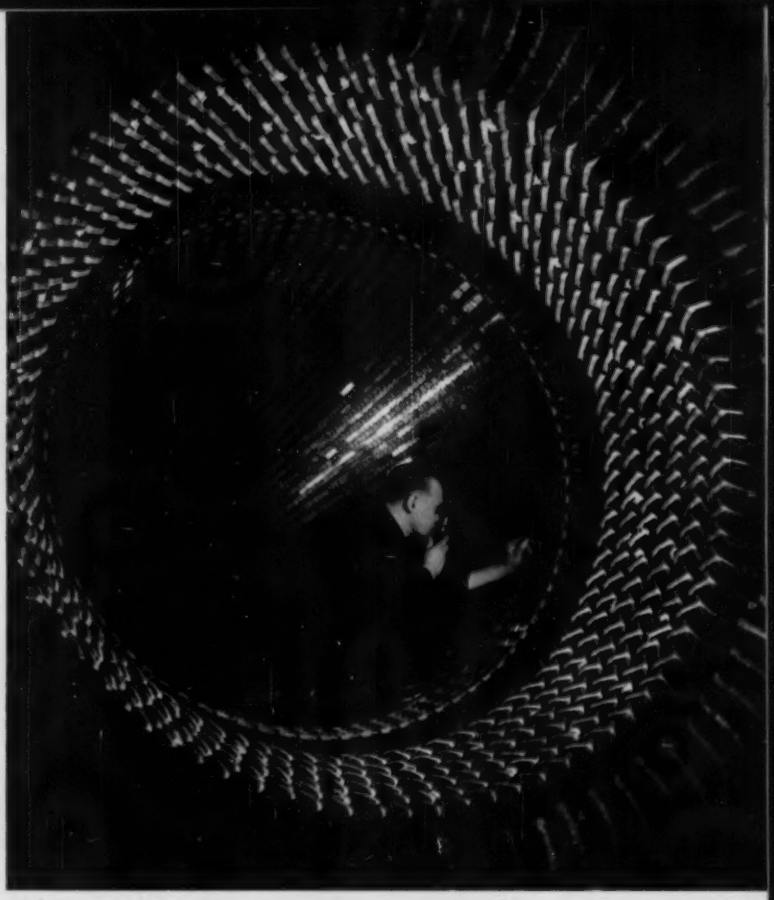
TO NEW KNOWLEDGE, BETTER PRODUCTS

Fantastic load growth is projected for the next 10 years, 20 years, 30 years. The nation's electric utilities will meet it. What are the problems facing the industry? Bringing high voltage close to load, controlled dispatching; in generation—temperature, pressure, vibration, approach to theoretical limits of existing equipment, and a host of others. Out of this maze of interrelated problems, Westinghouse is bringing new products, new systems, new ideas to meet the many future needs of the electric utility. Westinghouse considers this program its obligation to the industry . . . an obligation fulfilled only by a broad policy of reinvestment of earnings into research and development.

New Westinghouse
Research Laboratories

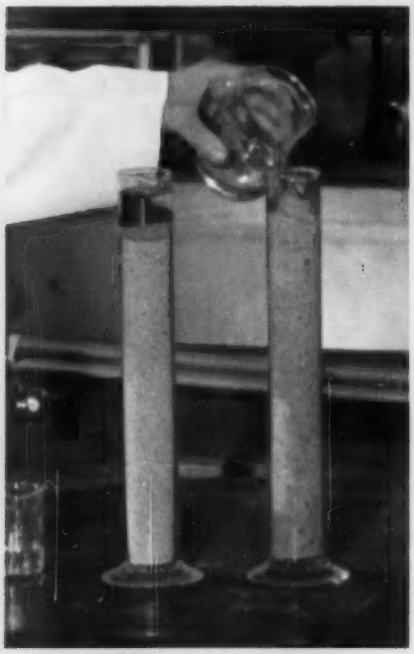
YOU CAN BE SURE...IF IT'S Westinghouse

1. From 19 years' research . . . Thermalastic coil insulation, most stubborn insulation known



2. From a basic knowledge of metals and vibration . . . research with rifle accuracy

4. Electro-negative gas sponges up arcs



3. Making small molecules out of large ones cuts dry-type distribution transformer size up to 50%

6. At Materials Engineering, sureness is designed in

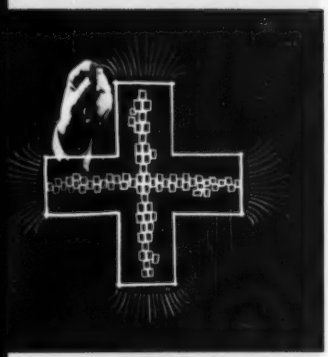
HERE IN THE WESTINGHOUSE
RESEARCH LABORATORIES

1958 was years ago

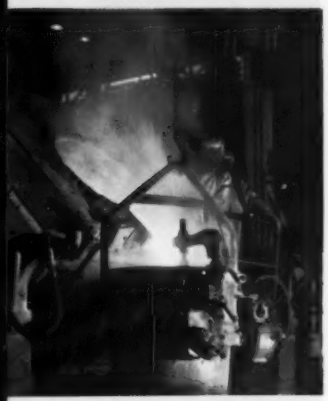
PLOWBACK OF EARNINGS PRODUCES RADICALLY NEW METALS, INSULATION, PROCESSES

Only one development in five from Westinghouse research is the result of a single science. Not only teams of scientists, but teams of sciences are today discovering new knowledge, channeling it toward practical applications of tomorrow.

Westinghouse fundamental research is a panoramic approach to solving the problems of the electric utility industry and to achieving the long-term objectives that underlie them.



5. In metallurgy . . . magnetism turns a corner



7. New metal alloys from formula to pilot-scale production

1. FROM 19 YEAR'S RESEARCH . . . THERMALASTIC COIL INSULATION, THE STUBBORNEST INSULATION KNOWN

What is it? An overlapping barrier of large mica splittings locked into a memory-type resin bond. It's thermally stable. Chemically inert. Rejects moisture. Won't embrittle. Stays elastic. Hugs the copper to which it is applied. Its reliability is proved by 40 million kva in service—on large motors and generators.

2. FROM A BASIC KNOWLEDGE OF METALS AND VIBRATION . . . RESEARCH WITH RIFLE ACCURACY

Problem—higher and higher pressures and temperatures, steam flowing through turbine blade paths at greater speeds. At the research center, mathematicians determine stresses; physicists make models of molecular structure of an alloy, recently created a new alloy, Nivco, testing at 100,000-psi tensile strength at 1200°F. This means that from Nivco will come more efficient turbines.

3. MAKING SMALL MOLECULES OUT OF LARGE ONES CUTS DRY-TYPE TRANSFORMER SIZE UP TO 50%

Remarkable solventless silicones, industry's newest high-temperature, high-voltage impregnants, lead a double life. Silicones in viscous form, with giant molecules, barely flow; their function is to stay put, hold mica flakes together. Fluid (right-hand flask) silicones' small molecules penetrate thoroughly and then form void-free solid insulation to stand heat better. Result—product size cut drastically.

4. ELECTRO-NEGATIVE GAS SPONGES UP ARCS

Presently applied on high-voltage switches, sulfur-hexafluoride is one of the most effective arc-interrupting agents known. In the test shown here, a 10-kv arc in the horizontal tube of air is instantly quenched when injected with SF_6 gas.

5. IN METALLURGY . . . MAGNETISM TURNS A CORNER

Cubex®, a newly developed alloy, breaks through a long-standing magnetic barrier, promises significantly improved performance of motors, transformers and other apparatus. The metal crystals are aligned in ice-cube fashion so that magnetism readily flows in four directions instead of two, turns corners with less resistance.

6. AT MATERIALS ENGINEERING, SURENESS IS DESIGNED IN

In the Materials Engineering Departments, research discoveries are transformed into practical engineering form. Projects are then turned over to operating divisions for application. An example is the procedure developed by Materials Engineering for ultrasonic testing of rotors and spindles. This procedure has contributed heavily to the unexcelled record for dependability of Westinghouse turbine generators.

7. NEW METAL ALLOYS FROM FORMULA TO PILOT-SCALE PRODUCTION

Bridging the gap between initial development and mass production is Blairsville . . . completely equipped for metals analysis and pilot-scale production. Nivco, alloys for atomic energy equipment and other metals used throughout the company are being developed here.

YOU CAN BE SURE . . . IF IT'S

Westinghouse

Curiosity in depth . . .

FROM 6000 ENGINEERS AND SCIENTISTS AND 200 LABORATORIES COME NEW KNOWLEDGE, NEW PRODUCTS, NEW SYSTEMS

Laboratories in every operating division of the company are continually engaged in both long- and short-range product development and improvement programs. Many of these projects originate at the Research Laboratories, are further developed, designed and tested at the divisions. Most problems directly involved with product improvement are solved with the division's own facilities.

1. $7,500,000 WORTH OF ABSOLUTE QUIET

This is one of the world's largest anechoic half-spaces where complete sound measurements can be made on transformers far larger than any presently in service. With the help of this multimillion-dollar facility, transformers of the future will be smaller, lighter, quieter, more economical.

2. PUTTING THE PRESSURE ON GAS TURBINES AND COMPRESSORS

The variable density wind tunnel helps create vital design advances. It tests model blade profiles and paths under all operating pressure conditions. Highly loaded gas turbines can also be investigated. The most promising designs are selected for full-scale testing in high-power rigs.

3. $6,000,000 INVESTMENT IN ADVANCED TURBINE DEVELOPMENT

Through the work done at the new development laboratory, the Steam Division is now building the world's most efficient and one of the largest turbine generators, for 5000 psi 1200°F, the most advanced steam conditions now planned. Development work at the lab ranges from bearings to complete blade paths.

4. ONE TURBINE DEVELOPMENT CAN SAVE A UTILITY UP TO $450,000

In a 200,000-kw generating plant, 1% improvement in heat rate can, depending on fuel cost, justify a utility capital investment of up to $450,000. Photoelastic test of a new blade root shows stress concentration under simulated operating conditions. Tests like this lead to an array of turbine developments, providing increases in efficiency and savings to utilities.

5. FIVE MINUTES TO A BETTER TRANSFORMER

Power transformer design time has been drastically reduced by this IBM 705 computer, freeing engineering time for the creative development of tomorrow's transformers.

6. SEVEN VEILS AGAINST WEATHER

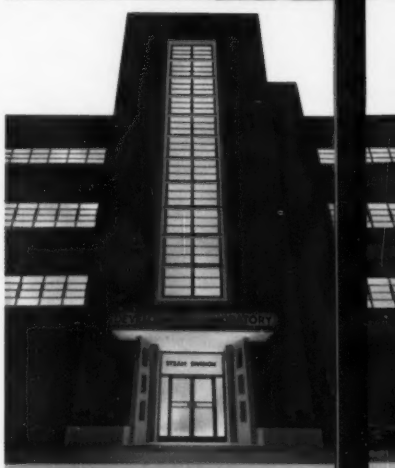
A half-million-dollar investment has created seven modern laboratory facilities for development of watthour meters at the new Raleigh plant—chemical, metallurgical, environmental, life test, mechanical, analysis and electrical development. From the chemical lab, for instance, come new organic and inorganic finishes for protection against everything from salt spray to ultraviolet light.

7. 5,200,000-VOLT SKYSCRAPER

Used in the verification and testing of new insulation systems for transformers, this surge generator is constructed from 104 100-kv capacitors in layers to a height of 52 feet. This unique design tool is part of the ultramodern transformer research and commercial testing laboratory.

8. THREE BILLION VOLT-AMPERES OF SURENESS

With capability to duplicate virtually every known system characteristic under controlled conditions, the High Power Laboratory has proved to be the industry's most valuable single design tool. For over 32 years, the capability and availability of this facility have fostered designs which have saved utilities millions of dollars.



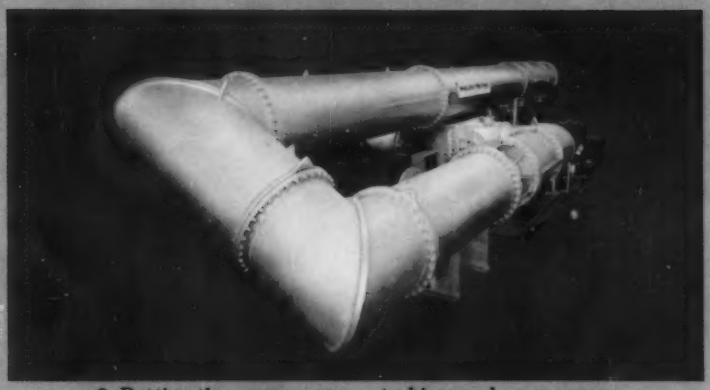
3. $6,000,000 investment in advanced turbine development

6. Seven veils against the weather

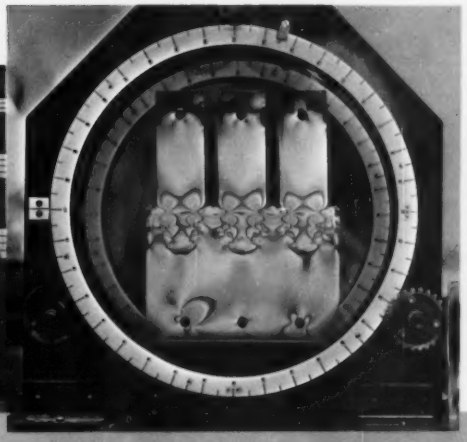
YOU CAN BE SURE...IF IT'S

Westinghouse

1. $7,500,000 worth of absolute quiet

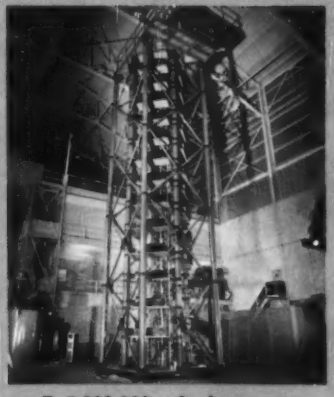


2. Putting the pressure on gas turbines and compressors



4. One turbine development can save a utility up to $450,000

5. Five minutes to a better transformer

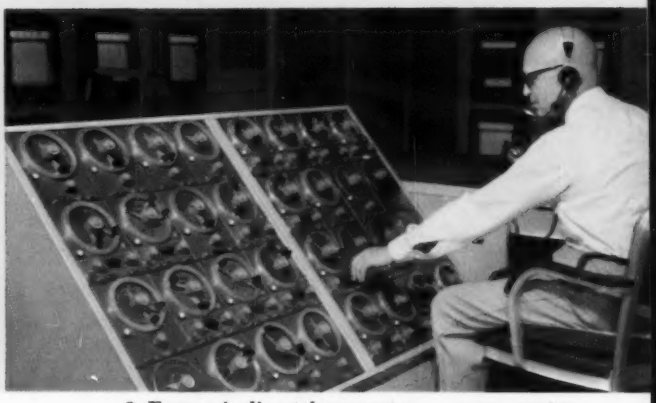


7. 5,200,000-volt skyscraper

8. Three billion volt-amperes of sureness

1. Out of snow and rocks . . . a laboratory

2. How to climb a mountain in total dark



3. Economic dispatch computer . . . nerve center of West Penn Electric interconnected system

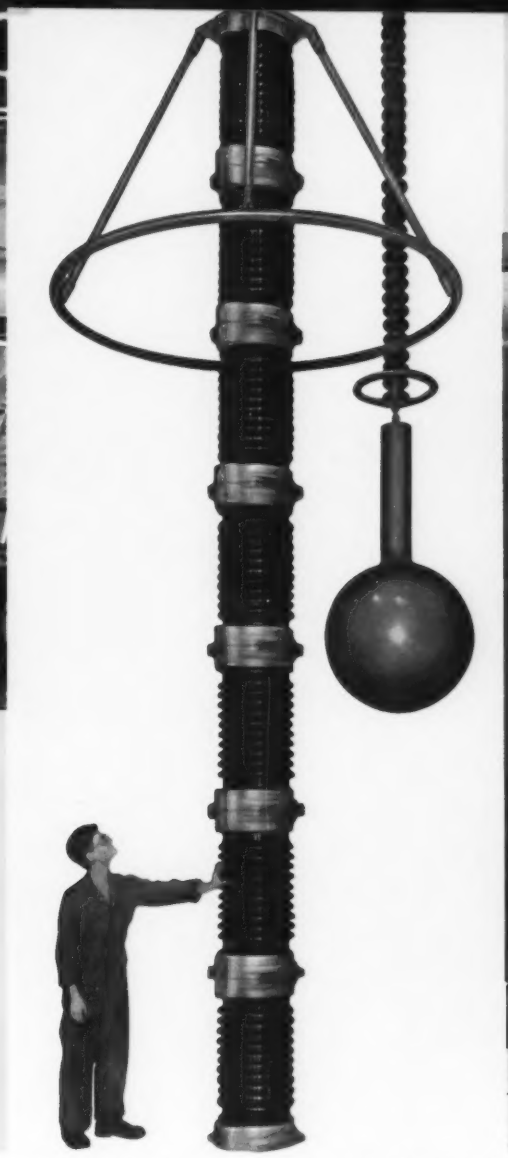
Plowback creates breakthroughs

TO HELP UTILITIES PLAN FUTURE SYSTEM COORDINATION AND ECONOMICS

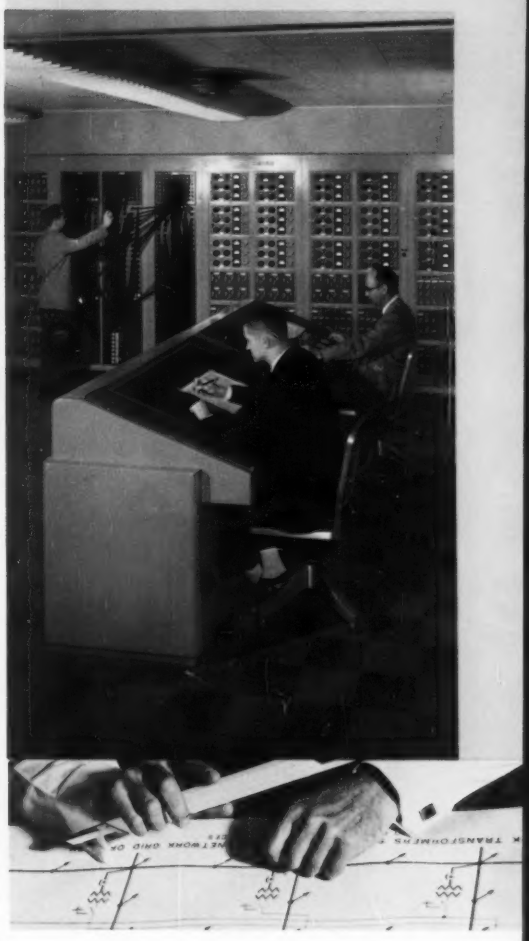
A broad area of communications at Westinghouse, helping the industry plan, evaluate, test and apply new ideas and systems, is the Electric Utility Engineering Department. Within the department's engineering groups, for example, sponsor engineers, assigned to utilities in specific areas of the country, review broad application and engineering problems and direct studies for their solution. Other electric utility engineering groups are assigned to specialized problems and long-range studies advancing the fields of generation, transmission and distribution. Service engineers and consulting and application engineers provide a strong right arm in the field. These groups apply both a broad knowledge of the industry and specialized experience to your problems of today and to your objectives for the future.

1. OUT OF SNOW AND ROCKS . . . A LABORATORY

Broadening the test program that began with A.G.&E. at Tidd Station, an extra-high-voltage test transmission line has been built at 10,000 feet elevation in the Rockies in cooperation with Public Service Company of Colorado. For the specific purpose of measuring corona and radio influence especially under violent extremes of weather, voltages ranging from 173 to 500 kv are being investigated. Knowledge gained here will shorten the road



5. A five-state power network in one room



4. How lightning arresters keep ahead of lightning

to economical transmission of large blocks of power at super voltages, will help assure the equipment to handle it.

2. HOW TO CLIMB A MOUNTAIN IN TOTAL DARK

Automex—or automatic experimenter—could solve this kind of problem, if turned loose on it. At Westinghouse, its job is to reach a control objective when complete knowledge is not available. A general purpose automatic control, this machine studies problems, profits from its own mistakes. As part of an automation system, Automex may one day run an entire chemical plant or paper mill.

3. ECONOMIC DISPATCH COMPUTER . . . NERVE CENTER OF WEST PENN ELECTRIC INTERCONNECTED SYSTEM

Trends toward integration of whole power systems and interchange between systems put a premium on precision and speed of dispatching. The Westinghouse computer determines the most economical output of all generating stations automatically, specifies correct spread of load, greatly simplifies dispatchers' problems.

4. HOW LIGHTNING ARRESTERS KEEP AHEAD OF LIGHTNING

This SVS station arrester, even after 1200 lightning surge tests at the Switchgear Division, shows no change in performance characteristics. Improved Autovalve® arrester blocks, rigid production quality control, continuous high-voltage surge testing have produced designs reducing arrester discharge voltage by 20% in recent years.

5. A FIVE-STATE POWER NETWORK IN ONE ROOM

Here is the world's largest a-c network calculator, with 36 generating stations, 580 circuits, capable of simulating the largest power systems. System planning in the fields of voltage regulation, stability studies, short circuit analysis and many others has been an enormous timesaver to hundreds of utility engineers who have used this facility and who are welcome to do so.

YOU CAN BE SURE...IF IT'S Westinghouse

1. From Westinghouse will come the next "first" in atomic power

3. Super-pure... they count the molecules

2. Perpetual power at 450°F below zero

MADE POSSIBLE THROUGH WESTINGHOUSE REINVESTMENT OF EARNINGS ...

Ideas in research discipline the unknown

Research at Westinghouse is a vast quest for new knowledge. The electric utility industry has in the past benefited heavily from Westinghouse research. The industry is continuing to benefit—in money saved, in hours and years saved, in goals achieved—and will into the future. This is because Westinghouse is continuing to pour energy, imagination, talent, money into extensive programs of research.

1. FROM WESTINGHOUSE WILL COME THE NEXT "FIRST" IN ATOMIC POWER

The Westinghouse Testing Reactor will generate answers, not line kilowatts. This facility, under actual conditions of irradiation, temperature and pressure, will evaluate fuel elements and reactor equipment. Knowledge of nuclear technology gained here will enable utilities to produce commercial atomic power sooner and at lower cost.

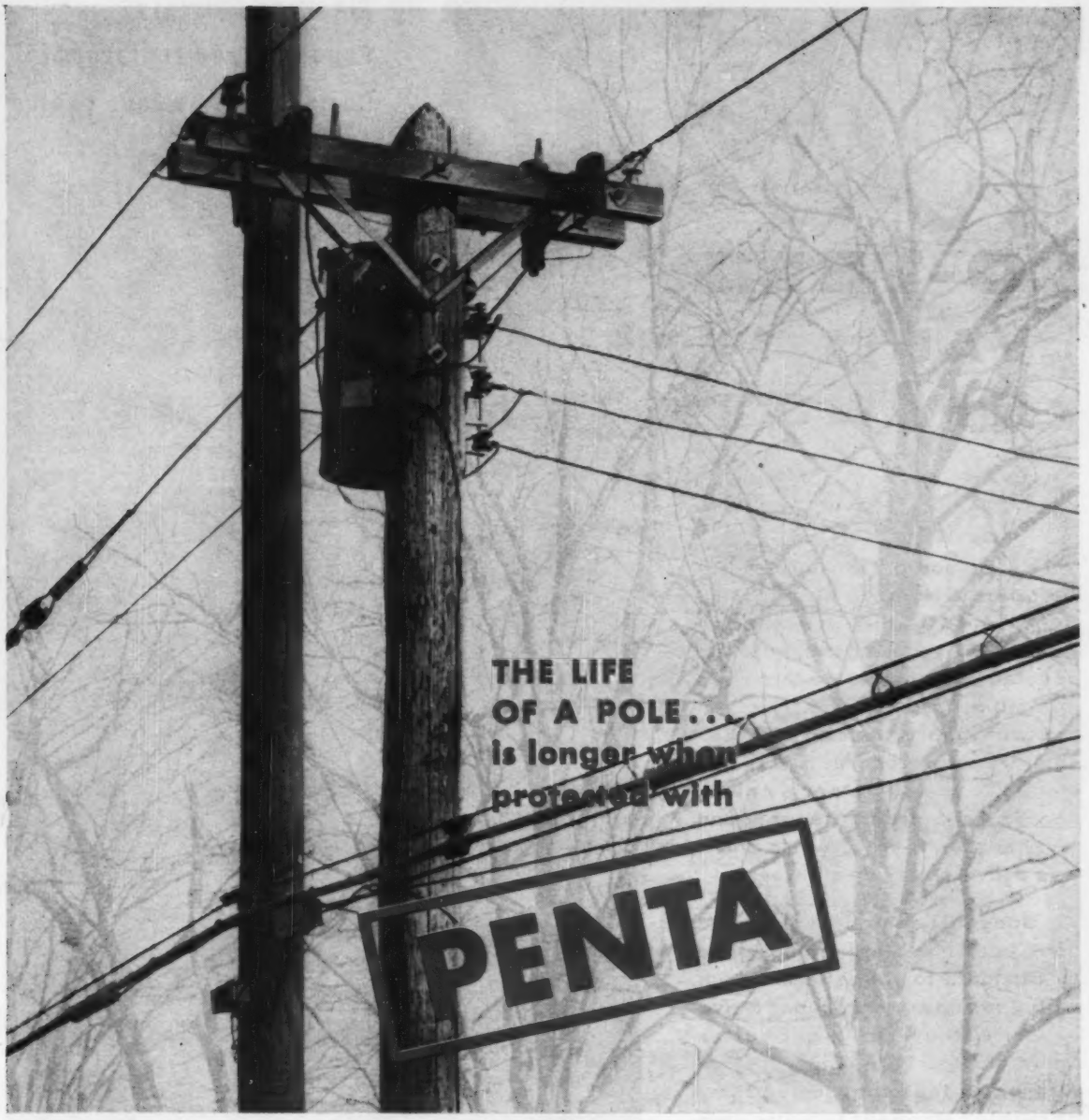
2. PERPETUAL POWER AT 450°F BELOW ZERO

At temperatures such as this, many metals lose all measurable resistance, become perfect diamagnets, circulate induced electric current in a closed system—apparently forever. What will come from this superconductor development? Can electric power be stored? Will current in the future be transmitted over tiny wires instead of cable?

3. SUPER-PURE . . . THEY COUNT THE MOLECULES

The process is known as cage-zone refining, achieving metal pure to a few parts in a billion. Material being melted acts as its own crucible. The bar is melted progressively end to end, drawing impurities in one direction. Semiconductors now. In the future, a procession of useful developments will come from this basic work at Westinghouse. CP-1047

YOU CAN BE SURE...IF IT'S Westinghouse



Today, more and more men with maintenance on their minds will tell you . . . it's good business to protect lumber with PENTA treatment. Here's why:

1. Costs no more — Service records show PENTA treatment gives poles, cross ties and other lumber for exposed structure extra long life. Yet PENTA treatment costs no more than ordinary preservatives.

2. Won't leach out — Because PENTA is an oil-borne rather than water-soluble preservative, it doesn't leach out, leaving wood vulnerable to rot and termites.

3. Clean to handle — Construction and maintenance supervisors know that workmen handle clean wood faster, more efficiently — and with fewer kicks!

Reichhold is a major supplier of PENTA to the wood industry and to wood users. If you haven't done so yet, investigate this modern method of protecting your lumber investments — write for the name of your nearest Reichhold distributor of PENTA.

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite
Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenate
Sulfuric Acid • Methanol

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N. Y.

Creative Chemistry . . . . . Your Partner in Progress

RCI

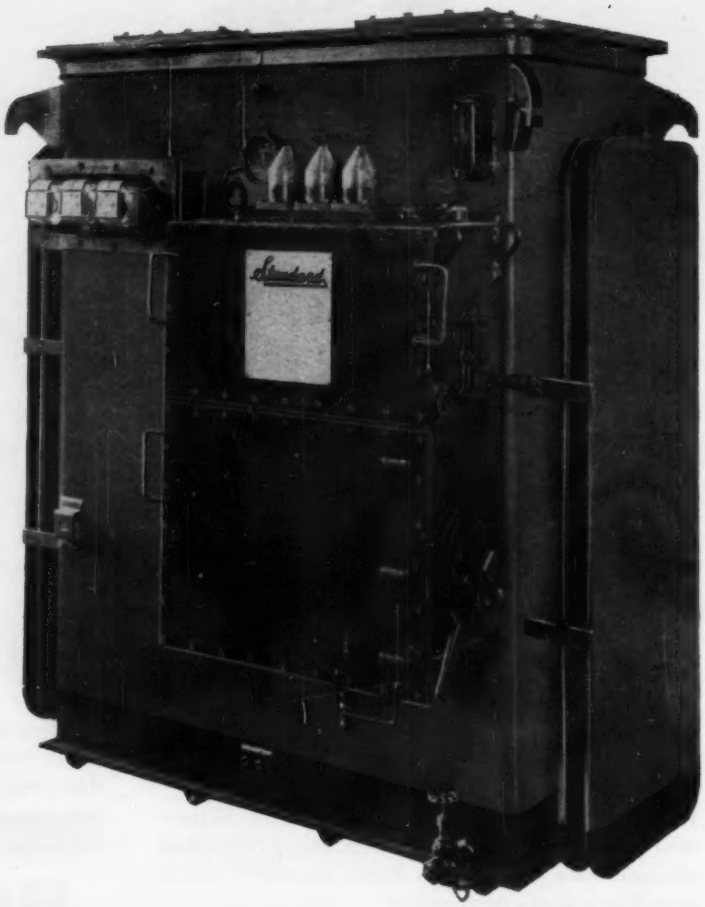
New!

Six week delivery
Pancake type radiators
Components of your choice

LO-TEMP*
VAULT TYPE NETWORK TRANSFORMERS

This Standard Transformer Lo-Temp unit is three phase, 750 KVA, 14,400 volts primary and 480Y/277 volts secondary. It is a special, designed to go through a minimum sized opening. This unit costs no more than an off-the-shelf transformer, yet it was designed to the customer's specs, beats all requirements for sound level and temperature rise and it was delivered in just six weeks.

It doesn't cost a penny more to have your transformers designed by Standard to your specs. Check with your nearby representative or write to us. You'll get better transformers with longer life delivered in less time. Sound impossible? Prove it to your own satisfaction by getting the facts today. Ask your nearby Standard representative or write directly to us.



*LO-TEMP TRANSFORMERS PROVIDE EXTRA CAPACITY AT NO EXTRA COST.

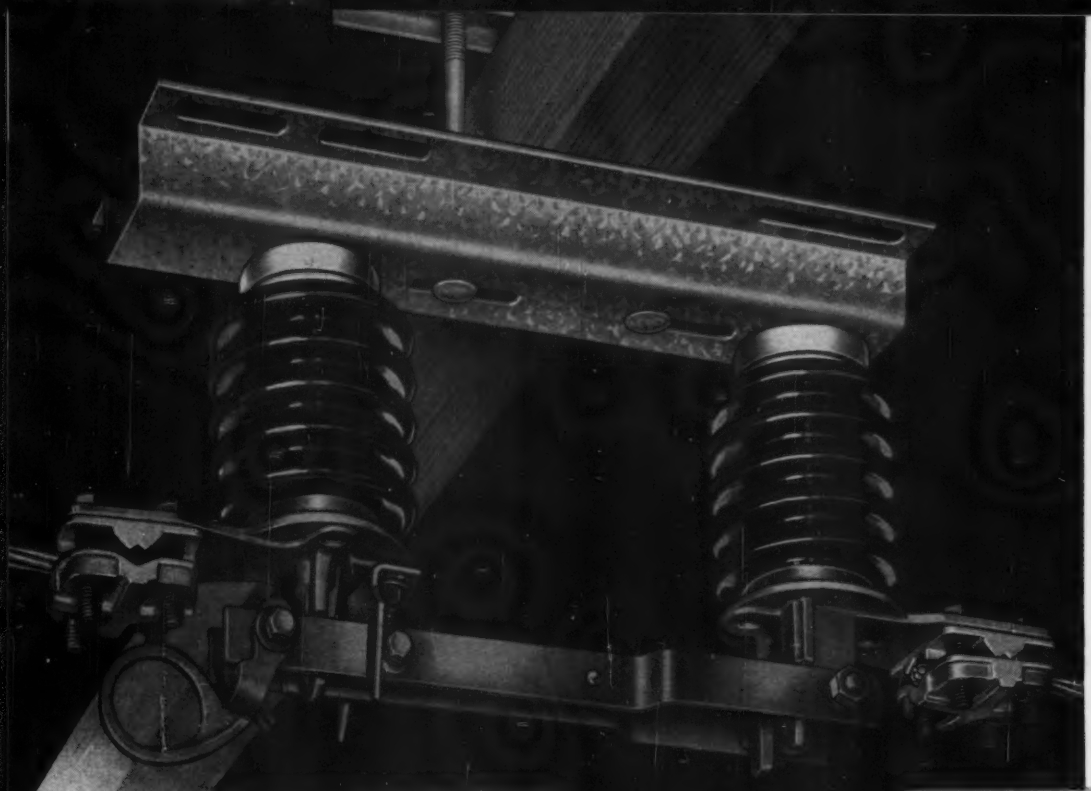
LIVE BETTER ELECTRICALLY

Phone Warren 2-1563

Standard Transformer CO.

WARREN, OHIO

"WHEREVER THERE IS POWER"



Type MC
400 and 600 amperes

Write today for the Kearney Catalog, Section 6, on Hook Operated Disconnects

NOW

peak performance
at lowest cost with

KEARNEY

• hook operated DISCONNECTS

Type MCL—200 and 400 amperes. Note hooks for use of hot-stick load interrupting device.

Sturdy, simplified construction of Kearney Center Bolt type Disconnect Switches offers field-proved performance with substantial cost savings. Current-carrying parts comply with all NEMA standards for heat rise and surge capacity. One-piece casting of terminal pads and contacts minimizes transfer points, reduces heat. Blades and blade lock are exceptionally strong and rigid. See and test this superior equipment—discover how *you* can get maximum performance at minimum cost.

- **Blade withstands 80 lbs. thrust at 90° to pull ring without distorting.**
- **90° blade stop in open position checks blade from falling free.**
- **Positive latch and pry-out prevent galling.**
- **Hinges carry no current, permit best mechanical design.**

JAMES R. KEARNEY CORPORATION • 4224-42 Clayton Avenue • St. Louis 10, Mo.

394

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

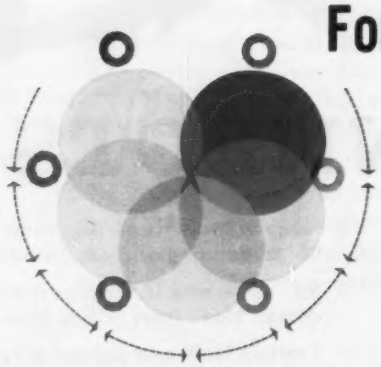
Specify Kearney Products

Plants at: **ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA**

Pennsylvania

Introduces:

A NEW MORE RUGGED POLE STAR



Orange circles represent the five tap positions in which the movable, double-disc contact can be placed. A coil spring holds the discs firmly in place against adjacent stationary studs, represented by the smaller circles. The coil spring also results in snap-action movement from one position to the next when the tap changer operating handle is turned.

For: Greater Dielectric Strength

Higher Impact Strength

Lower Power Factor

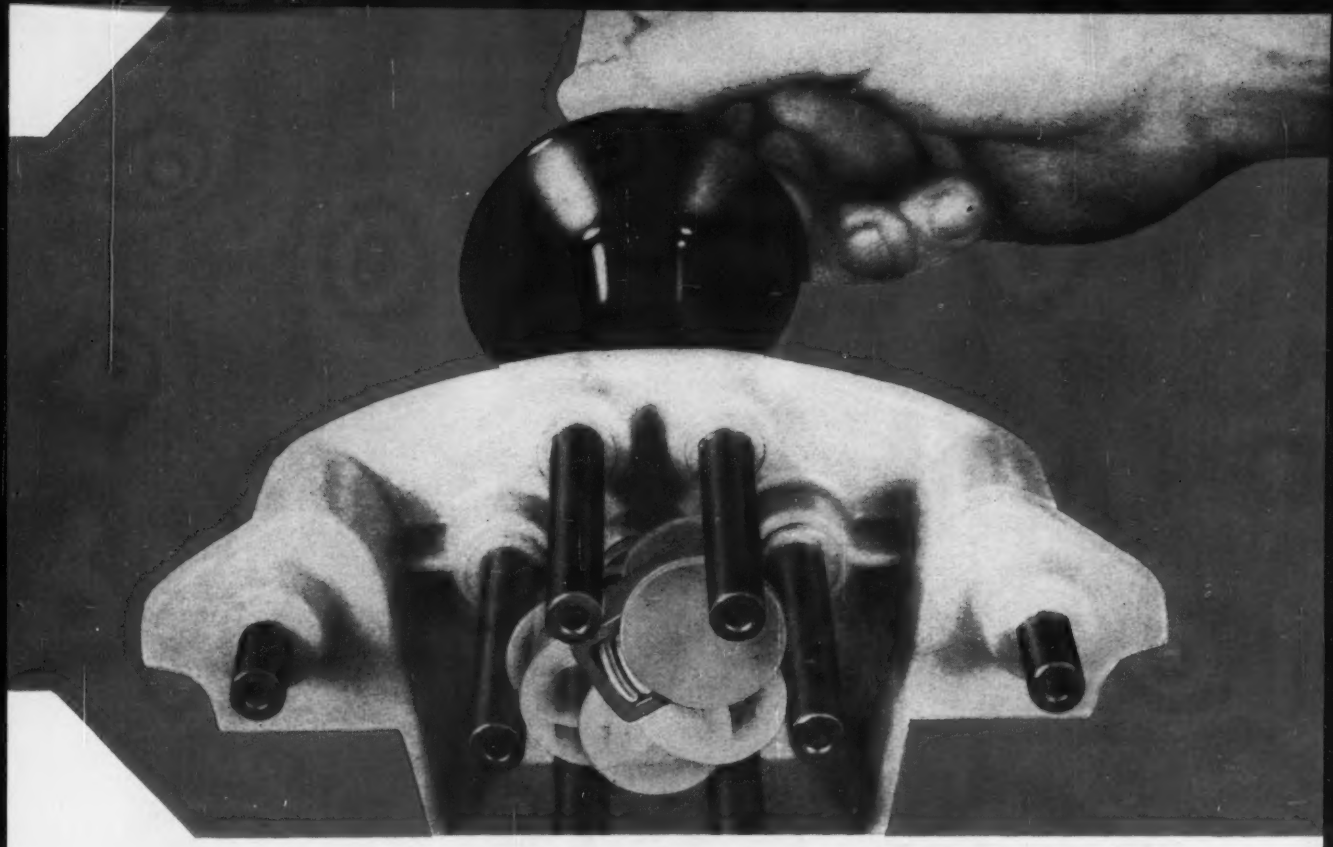
Excellent High Temperature Stability

More Accurate Dimensional Stability

Longer Creepage Distances

Elimination of Sludge-Gathering Projections

PENNSYLVANIA DISTRIBUTION



TAP CHANGER

The new tap changer is designed for all Pole Star distribution transformers through 167 kva, 18 kv class and below. Months of meticulous testing and research conclusively proved the superiority of glass-fibre-filled alkyd resin for this application. By providing far greater impact strength than the porcelain previously used for the tap changer body, alkyd resin imparts a new ruggedness to the Pole Star tap changer.

The new tap changer also has outstanding electrical characteristics—greater dielectric strength, lower power factor, longer creepage distances—as well as an ability to withstand extreme and sudden temperature changes. Elimination of sludge-gathering projections alone (there are no nuts and bolts on the top surface) can lengthen service life in cases where moisture enters the tank when taps are changed.

The new tap changer is one of the many Pole Star "plus" features. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

Design and Construction Features of New Pole Star Tap Changer

1. New tap changer body is made of glass-fibre-filled alkyd resin, in which modern materials research has combined the most highly desirable electrical and mechanical characteristics.

2. Stationary copper studs are molded into tap changer body. Resulting absence of nuts and bolts on top surface provides greater creepage distances . . . eliminates sludge-gathering areas.

3. Floating brass roller with double-contact discs is loaded by coil spring that snaps roller into exact tap position when operating handle is turned.

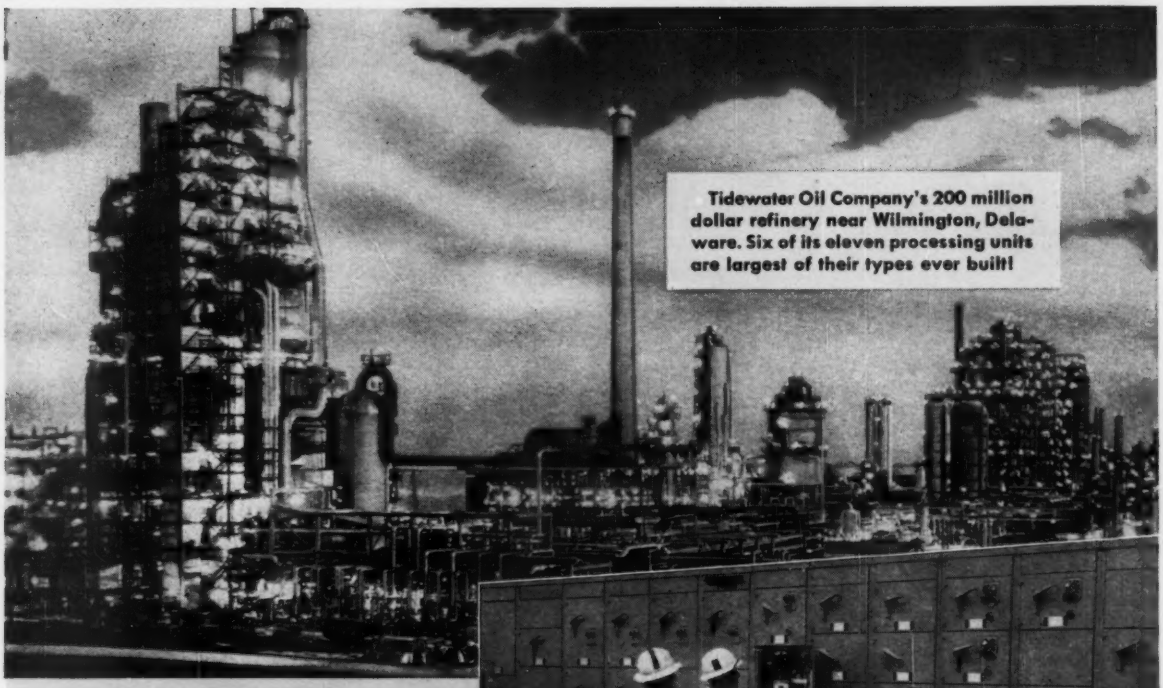
4. Crimping with pneumatic tools provides outstanding electrical and mechanical connection that neither age nor vibration will deteriorate.

5. Easy-to-read tap changer dial is located above oil level. Extra-large letters are white on solid black background.

TRANSFORMERS

PENNSYLVANIA POLE STAR TRANSFORMERS

McGRAW EDISON



Tidewater Oil Company's 200 million dollar refinery near Wilmington, Delaware. Six of its eleven processing units are largest of their types ever built!

SQUARE D CONTROL CENTERS

serve New

TIDEWATER REFINERY

Here's Why Square D is Your Logical Choice, too!

INCREASED SAFETY! • Bus bars fully enclosed, rigidly supported and have ample cross section. Circuits isolated by individually enclosed plug-in units. Disconnect handle gives maximum operator protection.

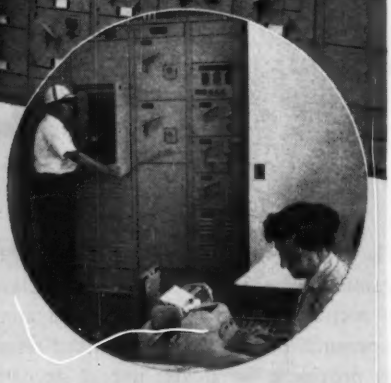
FLEXIBILITY! • Individual plug-in units or complete sections easily added, removed or exchanged. Pushbuttons, pilot lights, and selector switches readily added to unit doors.

INSTALLATION ECONOMY! • All wiring channels are large and accessible from front without removing units. No "wire fishing."

SPACE ECONOMY, TOO! • Up to six combination starters fit in a 20" x 90" section. Plug-in unit heights designed in space-saving increments of 3".

SUPERIOR DESIGN you can actually see and feel. Practical, modern styling. Greater structural strength gives more rigidity and assures precision alignment.

Write for CONTROL CENTER BULLETIN...
Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.



(Top photo) In the refining area Square D Control Centers provide a portion of the centralized control of pumps and compressors. In the maintenance shop they control power, heating, ventilating and lighting.

(Lower photo) Another Square D Control Center, located in the Employe Relations Building, provides pushbutton control of air-conditioning units and compressors. Infirmary X-Ray equipment and parking lot lighting also are remotely controlled from this Center.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

WATER WILL BE NO PROBLEM HERE! That's Anaconda polyethylene-covered paper-lead cable being pulled through manhole. This covering's outstanding moisture-resistant quality assures long years of trouble-free service—corrosive water seepage or no!

Put this cable in wet manholes—even corrosive waters can't hurt it!

It's Anaconda Polyethylene-Covered Paper-Lead Power Cable.

You can't always keep paper-lead cable out of water—but you can keep water, particularly corrosive water, out of your cable.

This Anaconda cable offers you all-important protection against water, alkalies and common acids in manholes or underground ducts.

The special polyethylene covering used over Anaconda paper-lead cable has moisture-resistance features unsurpassed by any other material. Its low coefficient of friction means easy pulling—less chance of mechanical damage during installation. Has excellent electrical properties and good insulation-resistance. Result: a long life of trouble-free service.

The Man from Anaconda has all the facts and figures. Call about your particular problem. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

58355

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM **ANACONDA®**

FOR **POLYETHYLENE-COVERED PAPER-LEAD CABLE**

5 reasons why

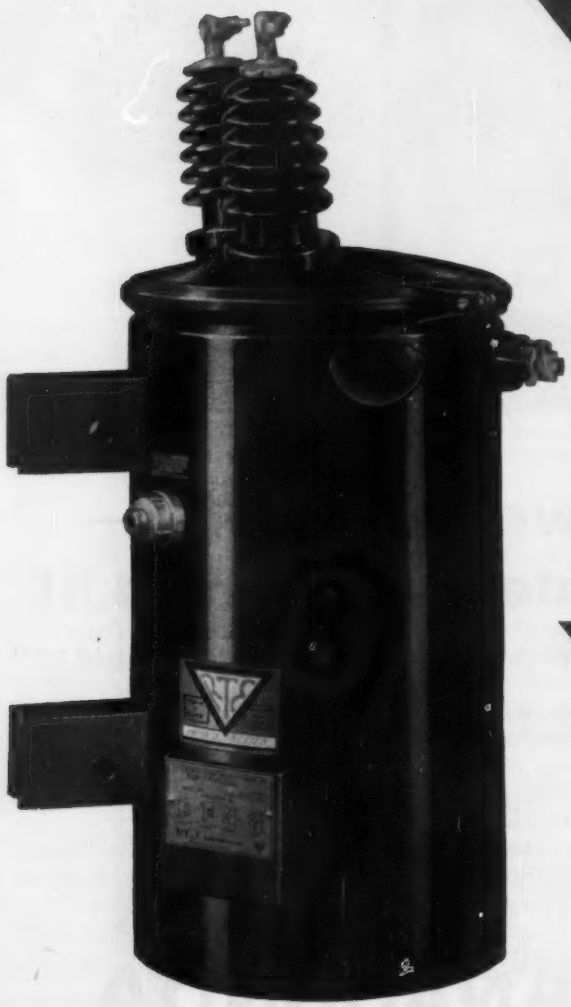
SUPERIOR HIGH AND LOW VOLTAGE BUSHINGS

HIGH VOLTAGE:

Bushings internally clamped — multi skirted for extra long creepage distance—terminals will accommodate either copper or aluminum conductor in full range of sizes required by EEI-NEMA Standards.

LOW VOLTAGE:

Bushings of wet process porcelain interlocked with tank to prevent rotation — solderless connector type terminals highly resistant to stress corrosion; will accommodate either copper or aluminum conductor in full range of sizes required by EEI-NEMA standards.



TIME SAVING EXTERNALLY OPERATED TAP CHANGER

Safer and more economical too. No handhole cover to remove, no unnecessary tank openings, no tap setting confusion, no danger of oil contamination. Husky cap reverses to become handle. Switch *must* be in tap position before handle can be removed. Molded in one piece, multi-skirted for long creepage and high surge strength. Low resistance, cool operation assured.

MAINTENANCE FREE TANK

Tank constructed of heavy-gauge, rust-resistant, copper bearing steel. All seams, brackets and mounting pads are arc welded to eliminate moisture collecting cracks and crevices. Tank finish is durable, three coat modified alkyd paint.

Corrosion dangers minimized by domed cover, stainless steel cover band, stainless steel mounting pads.

transformers are better

RUGGED CORE-COIL ASSEMBLY

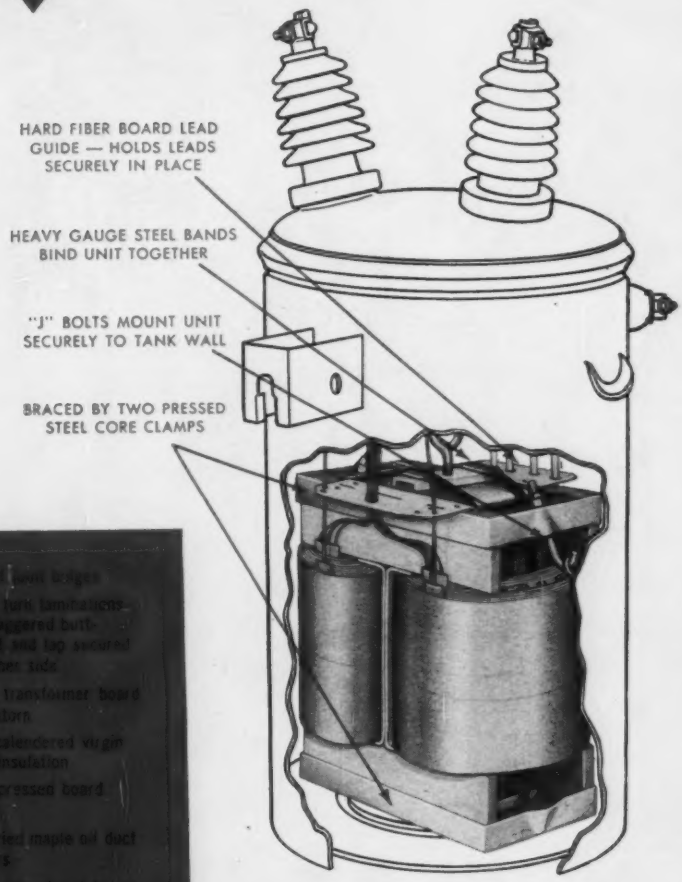
Maximum mechanical strength of core-coil unit is obtained by RT&E's unique core-coil clamping method. This eliminates the conventional vertical clamp members by utilizing the tank for this purpose.

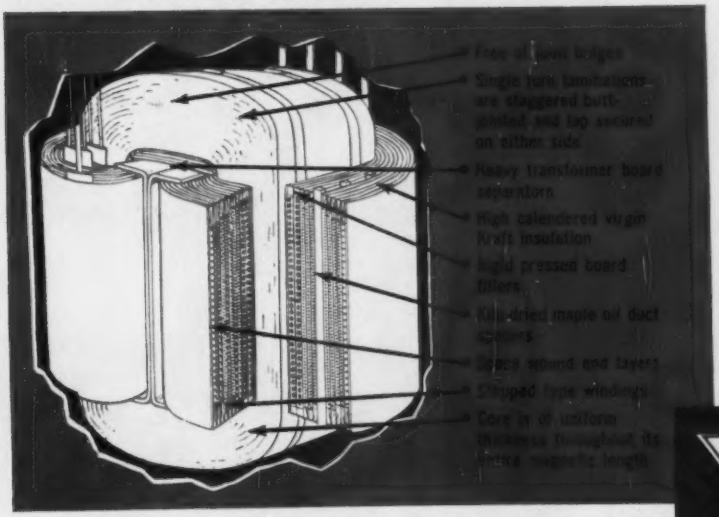
A rigid, unitized construction is thereby attained. Maintains all parts firmly fixed with relation to each other — additional coil surface is exposed to the cooling oil, and additional strength is gained for bracing the coil against distortion during short circuits. Quiet operation assured.

EXCLUSIVE CORE CONSTRUCTION

RT&E's exclusive wound core of single turn laminations with staggered, interleaved butt joints is formed from the finest non-aging, high permeability, cold reduced silicon steel.

This core, together with a coil of outstanding design, results in a transformer that has low losses, regulation and weight and is high in impulse strength and overload capacity.


HARD FIBER BOARD LEAD GUIDE — HOLDS LEADS SECURELY IN PLACE
HEAVY GAUGE STEEL BANDS BIND UNIT TOGETHER
"J" BOLTS MOUNT UNIT SECURELY TO TANK WALL
BRACED BY TWO PRESSED STEEL CORE CLAMPS

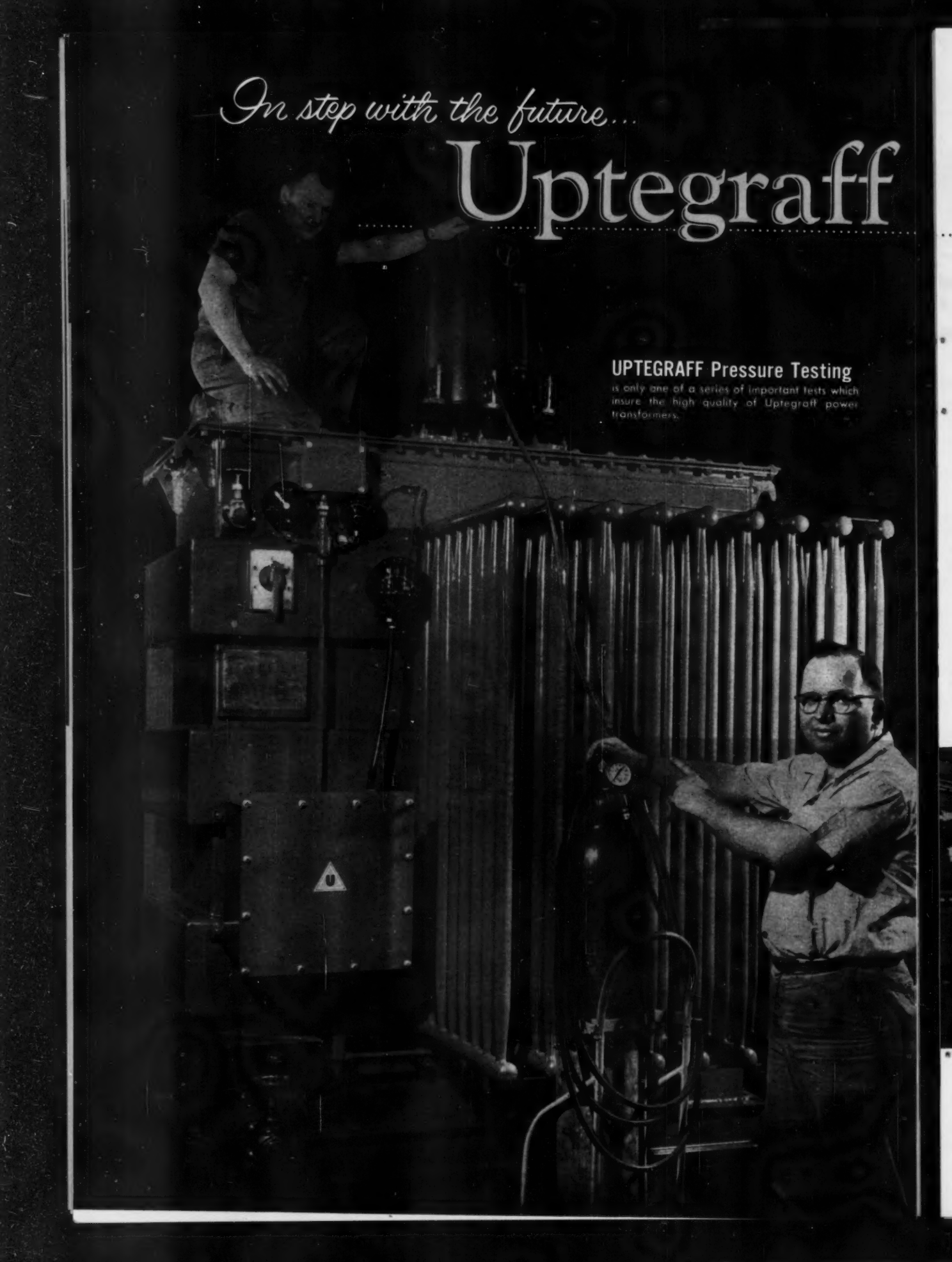


RT&E Transformers are designed and built to the highest standards. A dependable product produced by a dependable company and backed by a full five year guarantee. Available from warehouses conveniently located throughout the U.S.

RT&E CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON
Helping provide power for America

In step with the future...

Uptegraff



UPTEGRAFF Pressure Testing
is only one of a series of important tests which insure the high quality of Uptegraff power transformers.

POWER TRANSFORMERS

Advanced Testing Techniques Pay Off in Performance and Economy

Typical of the many quality control tests which Uptegraff applies in the production of transformers is pressure testing, illustrated on the left.

The transformer is completely filled with oil (or Askarel), so that the oil extends up into a container temporarily mounted on top of the transformer. Pressure, applied by a nitrogen bottle in the amount of three or four pounds, is sustained for at least four hours. This is a final pressure test to determine the integrity of all the seals, gaskets, glands, threaded fittings, and welds.

When transformer oil is removed to bring the liquid level down to the correct height, the nitrogen replaces the oil. Consequently, when the transformer is shipped, the space above the oil is filled with dry nitrogen. In this way the transformer is certain to be supplied free of any moisture or atmospheric contaminants. This is one of Uptegraff's advanced features which inevitably pays off in top performance and economy.

Write for Bulletin 133 . . . which gives complete Engineering Data on Uptegraff power transformers ranging up to 10,000 kva, liquid-filled (oil or Askarel) for indoor or outdoor service. Uptegraff also manufactures Load Center, Distribution, Network, Dry Type Lighting, Instrument and Specialty Transformers.

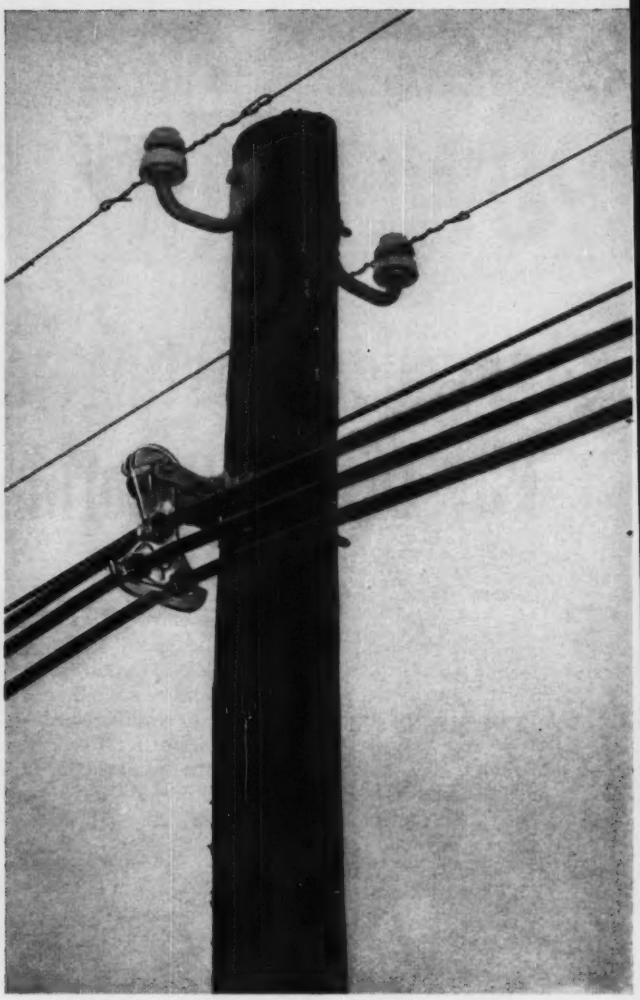
UPTEGRAFF Impulse Testing

Uptegraff goes to great length to assure the electrical integrity of transformers. One example of Uptegraff's thoroughness in testing the electrical quality is seen on the immediate left. Here a 2500 kva transformer on the test floor is being surge tested to determine its lightning withstand characteristics—so necessary to high level operation on today's modern power distribution systems.

R. E. UPTEGRAFF MANUFACTURING COMPANY

SCOTTDALE, PENNSYLVANIA

Conventional aerial system required cross-arms... tree-pruning is major cost and irritation factor with utilities companies.



New Roebling Aerial Spaced System with ROECLAMP requires only *one foot* of clearance through trees! Note improved, compact appearance. No cross-arms are needed.

Key to the system is Roeclamp ...unit construction means no separate parts... installs without tools... Linemen go for it!

Here lineman has grommets mounted on conductors and messenger and is about to mount ROECLAMP over messenger . . . ease of installation means one crew can install more line footage per day . . .

New Roeclamp Cable System Costs 60% Less than Self-Supporting Cables, Minimizes Tree Problems, Installs with Ease, Looks Better!*

Roebling Self-Supporting Aerial Spaced Cable is the perfect answer in areas where trees are a problem, where appearance is an important factor, or in areas where the most compact, economical and easily serviced system is desired. That means *just about everywhere!*

The Roebling System, with the remarkable new ROECLAMP, is designed for 5kv use (2400/4160Y and 4800 v delta systems) and 8kv use (4800/8320Y and 7200 v delta systems). Phase identification is positive at a glance, since cables are maintained in the same relative position along their entire length. Phases may be added or removed, and the system may be reinforced *without removing* ROECLAMPS from messenger! *Conductors may be replaced without tools* (except for splices and tapes).

Low impedance results in better voltage regulation – and the heat-dissipating properties of the Roebling system mean higher current-carrying capacity. Lightning protection and protection from falling tree limbs are provided by the strong copper-weld messenger, which runs the length of the system. Aluminum conductors come in 17 standard sizes and strand constructions to cover a broad range of applications. They are specially made with a greater number of finer strands to give extra flexibility. Standard insulation is extruded Roeplastic® P-11R7, although other types of extruded insulations are available, depending upon proposed usage.

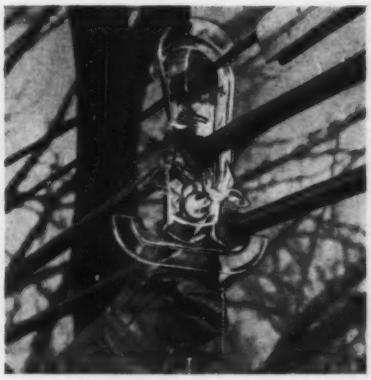
The Roebling Aerial Spaced System featuring the ROECLAMP costs less, installs fast, gives optimum service and requires minimum maintenance. You can't afford not to investigate it! Your Roebling representative can give you a demonstration of the revolutionary new ROECLAMP—and will give you more facts about this remarkable system. Call him – or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

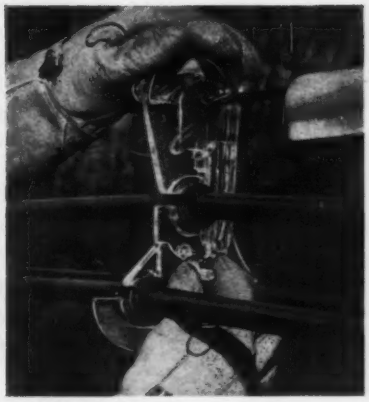
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

* Patent pending

One motion and ROECLAMP is on messenger and ready to receive conductors. Phase changes and repairs do not necessitate removal of clamp. ROECLAMP comes complete with grommets to fit messenger and conductors you order . . .



Note how easily conductors drop into place. Installation is measured in seconds, even with "boxing" gloves on. ROECLAMP is Plexiglas†, tests to over 1000-lb. breaking strength, offers outstanding weather resistance, best possible electrical properties . . .

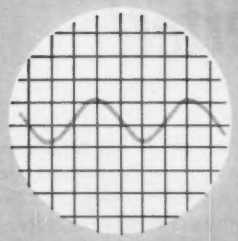


35 ROECLAMPS are required every 1000 feet. Installation is completed by hand-tightening of nut. Not even a screw driver is required!

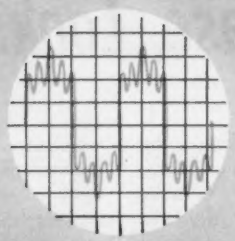
† Reg. T. M.—Rohm & Haas Co.

VAREX is Built for

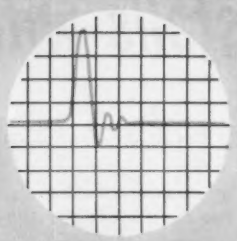
METHOD OF CONTACT LESSENS CURRENT DENSITY



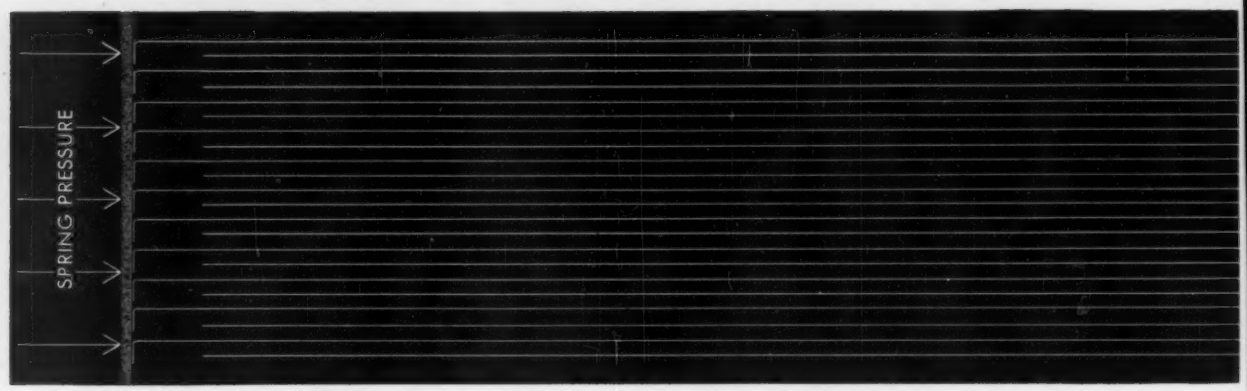
Normal 60-cycle current



60-cycle overcurrent with harmonics



Transient overcurrent



A capacitor operating on your lines can be expected to encounter the general types of current duty indicated above.

Closely tied to the unit's ability to withstand all types — especially the transient overcurrent duty which includes high current peaks caused by lightning strokes, switching surges and capacitor discharges through nearby line faults — is the system through which electrical contact is made with the elements.

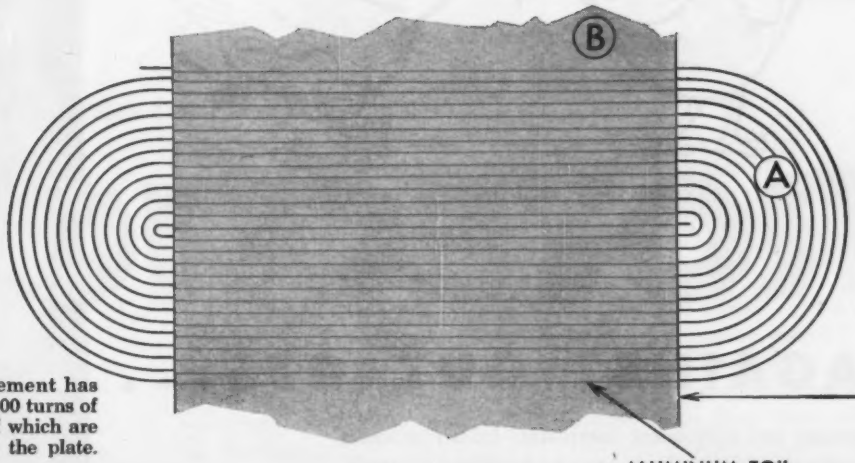
The spring-pressure system used in Varex has three basic advantages:

1. It provides generous contact areas and a large number of contacts. Current density at any single point is necessarily low.
2. Maximum length of current path is only the width of the foil, not the length.
3. Contact is outside the active dielectric, so electrical stress at contact points does not affect the dielectric.

Even under extra-heavy current duty, the current density in the foil in Varex elements will be low. That's why you can expect extra years of service from Varex capacitors.

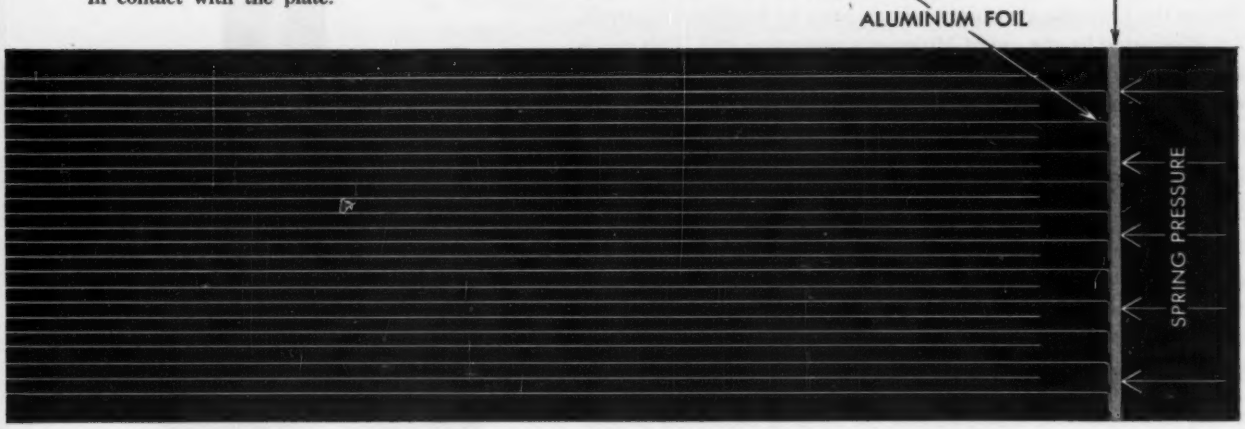
OHIO BRASS COMPANY, MANSFIELD, OHIO

All Types of Current Duty



END VIEW

Each Varex element has approximately 100 turns of aluminum all of which are in contact with the plate.



SIDE VIEW

The above drawing is exactly the width of a Varex element — 13 inches. The maximum path of current flow is the width of one foil — 12⅝ inches. The extended aluminum foil (A) at each end of the element makes multiple contacts with plates (B) which are held against element ends by springs (C).

Ohio Brass

4883-H

PROTECTION

AGAINST OUTAGES...

Service interruptions and subsequent complaints from customers due to the grounding of high voltage lines by birds and squirrels, are eliminated by the use of Moloney's protective cap. This cap is optional on all Moloney Distribution Transformers which have cover mounted high voltage bushings.

The high voltage line and connector are completely protected from birds, squirrels, etc. Cap covers all exposed live parts of the high voltage bushing assembly and a long sleeve protects the line.

Made of molded vinyl, the protective cap will have long life under any weather conditions. Openings are provided in the sides of the cap to permit flashover to the lightning arrester when the cap is used on protected transformers. Projections on the inner rim of the cap keep the cap in position.

MCDB-11

Specify the equipment that is designed, built, and tested for dependable performance under all operating conditions. *Make it Moloney all along the line.*

Moloney Distribution Transformers conform to EEI-NEMA standards and are available in all standard ratings and types.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Editorial Comment

APRIL 21, 1958

Need for Speed to Tell All-Electric Story

This page on March 24th carried an editorial entitled, "A Lesson in Unity: The Zinder Report". It called for immediate action on the part of electric utilities to present their all-electric story in the battle for the federal multiple housing market—specifically, housing for the armed forces. We have reason to repeat that call.

The need for speed among utilities in getting their all-electric story before the Army, Navy and Air Force is heightened by the fact that the end of fiscal 1958 is less than three months away. Military commanders who have funds authorized for housing are anxious to get those funds committed to a specific project. Otherwise, under Congressional appropriation regulations, these funds will revert to the Treasury.

A quick check with the Department of Defense resulted in a list of some 20 bases around the country, in Hawaii and Puerto Rico at which housing decisions are pending. In the Southeast alone, more than 9,000 housing units are at stake.

In the face of these circumstances, the electric utilities simply cannot afford to lose time. The average interval between a utility presentation and the awarding of a contract is, according to one authority, "just about a month". Allowing the barest time minimum, this means the power company must tell its all-electric story a month before the end of fiscal 1958, or about June 1st.

Presentation to the armed forces must be done now! What are we waiting for?

What's Happened to Yankee Ingenuity?

We find ourselves in complete agreement with the frank and realistic evaluation of American scientific and engineering progress traced before the American Power Conference in Chicago recently by Clarence H. Linder of the General Electric Company.

His points were these, in brief:

- Although the U.S. has led in exploitation of advances in science and technology we do not lead in their generation. We have *not* chosen to emphasize the kind of individual thinking that produces milestone contributions to understanding and knowledge.
- We tend to stress the experimental approach to design, and in many fields neglect the theoretical. We tend to modify the old and to build one or more models, test, change parameters, and test again in order to choose a design. And we carry multiple approaches to the same end far beyond the point where the most promising approach should be selected and others weeded out.

In making these points it was not Linder's intent, nor is it ours to imply that these peculiarities of US engineering philosophy represent a failure on our part. But today we face an "explosive" increase in the demands on science and technology. In meeting these demands American engineers and scientists need to recognize that solutions lie not necessarily in doing better what we already know how to do. Progress lies in proving the technical feasibility of new ways and means of meeting the requirments that face us tomorrow.

REA Backs Push on Appliance Loans

- **Anti-recession move gets support of trade associations**
- **Clyde Ellis says G&T loans are needed for effectiveness**

The Rural Electrification Administration, spurred by a request from President Eisenhower to stimulate the sales of electric appliances as an anti-recession move, is marshalling rural co-ops, manufacturers and trade associations into a "grass roots" campaign to increase sale of appliances, equipment, household wiring, and farm and home water systems.

Administrator David Hamil on April 11 wrote to cooperatives, manufacturers and trade associations urging the program.

"This strikes me," he said, "as being another opportunity for the rural electric systems financed by REA to demonstrate leadership in our country's progress, to make an excellent public relations move, and to benefit themselves, their members and their home communities in the bargain."

He told the co-ops that the National Electrical Manufacturers Association, the National Rural Electric Cooperative Association, the Inter-industry Farm Electric Utilization Council, Live Better Electrically, Farm Better Electrically, are cooperating in the joint effort.

He called on the co-ops to set up one or more meetings with dealers in their areas to push appliance sales in the period between May 19-June 14. Hamil pointed out that the program will be a good celebration of REA's 23rd birthday.

The campaign is being launched at a time of decline in the borrowing by co-op customers for appliances and other home and farm equipment. More than $5-million was put into REA appliance (Section 5) loans last fiscal year; right now the estimate is that the total for the year ending June 30 will be only $3,300,000. REA officials believe, though, the sales campaign will turn the trend up again.

Ellis Is 'In Accord'

Clyde T. Ellis, general manager of NRECA, says that he is "in accord" with the sales program. But he says that it "can be effective only" if the REA is able to make more loans to co-ops for generating, transmission and distribution lines.

When President Eisenhower started the ball rolling with his letter to Agriculture Secretary Benson urging that REA lending operations be stepped up, he commented:

"Funds are presently available which can be used to finance such (electrical) installations and purchases by consumers. Additional purchase of facilities would be of special benefit to the economy at this time."

In his letter to REA borrowers, Hamil laid out these kinds of promotions for the campaign:

Cooking schools, bonus coupons to be redeemed for new appliances, discounts and free installations, and a "waterama" to push purchases of water pumps, septic tanks, and so on. He also urged co-ops to tie in their promotional campaigns with the "national power use calendar."

The new program is a decided shift from previous REA policy. Hamil told the Senate Appropriations Committee last May: "We do not encourage any cooperative to borrow Section 5 loan funds."

Appliance loans have been authorized since the beginning of the REA. Co-ops borrow from the REA at 2% interest to re-lend at higher rates—REA recommends above 4%—to farmers for the purchase of electrical appliances, farm equipment, and any necessary new wiring.

From its beginning through February, the REA has loaned $31,348,989 to rural consumers.

However, these loans always have accounted for only a minor part of the money annually appropriated by Congress for rural electrification, averaging about 1% of the funds loaned annually (Section 4) for construction of generating stations, transmission, and distribution lines. Appliance loans accounted for 2.4% of Section 4 loans in fiscal 1956, 1.8% in fiscal 1957, and 1.6% in the first eight months of fiscal 1958.

The bulk of Section 5 loans—about 62%—go for "package sales" of farm and home appliances, usually about $200 per "package." They include everything from clocks and TV sets to milkers and brooders. Other loans are divided about 19% for water pumping facilities, 10% for irrigation equipment, and 9% for wiring.

Private utilities have questioned the loans of low-interest money to

Hamil Hopes '58 Will Turn Loan Trend Up

Fiscal Year	Sec. 5 Loans Authorized	Sec. 5 Loans Granted	Avg. Monthly Kwhr Use Per Farm
1948	$ 428,000	$ 253,281	121
1949	512,000	257,755	134
1950	1,941,000	982,763	146
1951	5,013,000	1,500,039	165
1952	1,684,000	1,677,510	184
1953	3,168,000	2,499,664	203
1954	2,033,000	2,669,790	226
1955	4,148,000	3,550,607	246
1956	4,645,000	3,913,331	270
1957	5,305,000	4,306,301	292*
1958 (Est)	5,307,000	3,678,000	...

*Preliminary

electric co-ops for re-lending to consumers for new appliances on grounds that this exceeds the original intent of the Rural Electrification Act, ie, to secure central-station electric power for remote farm areas. Another complaint is that some co-ops have used appliance loans to increase system loads, thereby justifying new Section 4 loans.

Sen Milton R. Young (R-N.D.) has criticised the co-ops for operating their own retail appliance stores. "I have been a staunch supporter of REA," he says, "I have defended them many, many times. But I do not like to see them get into any kind of business practice that is unfair to their competitors."

He emphasized that in approving loans to a cooperative, the REA should make sure that it is not conducting a "losing" operation in retail sales, "offset by higher rates for electricity. In so doing they (the co-ops) could injure the good businessmen . . ."

'Tax Exempt' Status Opposed

The National Retail Dry Goods Association also opposes the merchandising of appliances by "tax exempt" co-ops. About 12% of all electric co-ops maintain their own retail stores and re-lend REA-borrowed money to the consumers to buy electric appliances from the store.

The REA permits a co-op to make a Section 5 loan only when a farmer is unable to obtain adequate financing locally.

Cooperatives make between 15,000 and 20,000 appliance loans annually to farmers; REA averages between 30 and 100 loans a year to its electric borrowers. The average size of REA loans to co-ops is about $50,000 although loans up to $100,000 are approved.

The only requirement now for a co-op to borrow money from the REA for re-lending under Section 5 is the financial ability of the cooperative to repay it.

Co-ops must repay to the REA all funds they borrowed under Section 5 within five years, although they may obtain an additional two-year extension. Since cooperatives usually limit the payback time to 18 months for a rural customer, they are able to re-lend the same money several times before it must be repaid to REA.

Co-ops Mark a Milestone

More than five million consumers are receiving electric service as a result of loans approved by the Rural Electrification Administration. This was announced last fortnight by the U. S. Department of Agriculture.

REA, since its inception, has approved a total of $3.6 billion in loans to 1,080 electric borrowers, mostly rural co-ops. They operate in every state except Connecticut, Massachusetts, and Rhode Island.

The number of REA consumers increased rapidly after World War II and then the rate of growth began tapering off. The 1-million consumer level in loans approved came in Sept. 1940. The 2-million mark was reached in May 1946; 3 million in Nov. 1948; and 4 million in May, 1952.

The Senate agricultural subcommittee is considering a House-passed bill providing up to $325 million for fiscal '59 loans. The House action refutes the Administration's request for a $150 million direct appropriation plus legislation that would permit a like amount to be borrowed from private lenders (EW, March 3, p 66).

As cleared by the House committee, REA would receive $300 million for loans and a $25-million contingency fund. The committee's report to the House opposed unanimously the borrowing of private funds to re-lend to cooperatives.

One of REA's larger loans went recently to Pioneer Rural Electric Cooperative of Piqua, Ohio, after two years of negotiations. A $7.2-million loan will permit the co-op to build a 22,000-kw addition to the city's municipal power plant, a substation next to the plant, and 136 miles of new transmission line.

The city of Piqua will lease and operate the plant and sell power wholesale to the co-op. City officials said the wholesale rate will apply to a minimum monthly charge which is to take effect in the sixth year of the 40-year lease. The city hopes to pay off the lease in 20 years.

Indiana Ruling Arouses Ire

Indiana is the scene of a new development in a long hassle over REA loans. The state Public Service Commission recently ruled that rural electric membership corporations (REMC's) must obtain approval on federal loans. The Indiana Statewide Rural Electric Cooperative said the ruling was aimed at least partly to block a proposed $42-million REA loan for an REMC plant that a group of co-ops hope to build near Petersburg.

Iowans Favor Hike in REA Interest Rate

Sen Thomas Martin (R-Iowa) reports that 70.45% of 5,174 Iowans answering his "grass roots poll" were in favor of "increasing interest rates on REA loans to equal the interest paid by the government on its own bonds."

Higher rates received a majority vote in each of the seven occupational categories into which he separated the votes. The biggest spread in the voting came from the "business" category where 301 people favored an increase vs. 47 opposed. Closest vote was among farmers with 627 pro and 556 who prefer to leave the rate unchanged.

Martin mailed the poll to more than 40,000 Iowans.

SEN MARTIN: "Grass roots" opinion

Showdown Nears on Imports

The campaign for more protection from competing foreign imports is headed for a showdown.

General Electric Co, by requesting the Office of Defense Mobilization to rule on the so-called defense-essentiality of heavy electrical equipment as a broad category of manufactured goods, has opened the way for the Administration to settle claims that the electrical industry is vital to national security, and that competing imports threaten or impair U. S. defense.

ODM has moved quickly on the GE petition, following much the same procedure it used in making a favorable finding on a similar petition of domestic petroleum producers. A six-man committee of representatives from the departments of State—Commerce, Defense, and Interior—the Atomic Energy Commission and Tennessee Valley Authority will study the question.

The GE petition is the 15th plea for a defense essentiality finding brought since the procedure was set up in an amendment—section 7—to the Reciprocal Trade Agreement Act extension passed in 1955. To date, the agency has ruled favorably only on oil.

In making its plea, GE specified it is not seeking injury relief as under Tariff Commission escape clause procedures. It said foreign imports of turbines, generators, switchgear and similar heavy equipment are a small percentage of domestic production.

GE asked ODM to find:

- That the heavy electrical equipment industry is essential to the national defense.
- Foreign competition threatens or impairs national security because of lower quality and difficulty to replace and repair equipment.
- Higher tariffs, import quotas, or both are needed to maintain the domestic industry.

A favorable finding automatically goes to the President for a final decision.

'Windowless' Wall Captures U.S. Interest

McGraw-Hill World News—The Escombreras plant near the port of Cartagena in southern Spain has gained the title of Europe's most efficient steam station. The 280-Mw station is of indoor design.

For U. S. visitors, though, a main feature is the wall construction of the $35-million facility. Exterior of the turbine building lets light through square glass panes set flush with the outside of precast concrete blocks. The spaces flare to a circular section at the interior face.

The plant was built for Hidroelectrica Espanola by International General Electric. Gibbs & Hill served as consulting civil, and electrical engineers for engineering specifications.

AEC Reports on Insurance Proposals for Operators

The Atomic Energy Commission is making progress toward setting up permanent regulations governing insurance required of companies operating power reactors. But the agency says more legislation may be needed—from state legislatures as well as from Congress.

AEC, in a report to the Joint Committee on Atomic Energy, recalls that Congress last summer enacted the Price-Anderson law indemnifying reactor operators up to $500-million—but also requiring them to carry available private insurance.

The idea was to accelerate atomic development by removing fears that a reactor accident could result in crippling damage claims.

AEC lost no time in issuing a temporary regulation requiring each licensee to maintain $150,000 of financial protection for each 1,000 kw(t) capacity.

Minimum protection was set at $250,000. Insurance firms set $60-million as maximum coverage they will offer for a given site.

Suggested changes in AEC's proposed amendments to the temporary regulations would raise minimum private financial protection to $3 million for small reactors, and $60-million for reactors of 400 Mw(t) or more. Government indemnity remains at a maximum $500-million.

For reactors in the middle ground, the amendments set a yardstick which takes into account authorized power level, length of fuel cycle, and population near reactor site (the more people, the more insurance is required).

The same protection is required regardless of reactor type.

Let's Be Sensible About Public Relations!

Circling the mountain of accumulated public relations practices like his compatriot at the right, an Idaho utility man looks critically at the "group therapy" approach

Copyright 1958 by Henry L. Senger

THE IDAHO SIDE-HILL GOUGER

R. H. SESSIONS, Personnel Director, Idaho Power Co, Boise, Idaho

Far be it from me to claim kinship with public relations experts in the utility field. They obviously are a fraternity of specialized souls far above my poor power to add to or detract from the vexing dilemmas they enjoy today.

Like the famous Idaho Side-Hill Gouger, whose legs are much longer on one side than on the other, and who can only go around the mountain in one direction, I fear that I am destined forever to circle the mountain of accumulated public relations practices without ever having a chance of reaching the top.

This amateur attack on the biggest problem facing the private utility business today (socialization of the industry) would never have been written except for a remark made by my former boss, Kinsey M. Robinson, chairman of the board and the president of the Washington Water Power Co.

I don't suppose I have had the privilege of fifteen minutes accumulated conversation with Kinsey in the twenty years we have been apart. But I was his secretary and aide long enough to learn much of the background of sincerity that forged the conviction behind his statement.

Understand the Consumer

In the convention issue of Electrical World reporting the 25th annual meeting of the Edison Electric Institute (EW, June 24, 1957, p 97), he preferred to call public relations by the name of "consumer understanding." Although I may not be quoting him verbatim, the substance of the remark that stuck with me was simply this: Consumer understanding will be achieved only when we personally are willing to take time out to talk face-to-face, with each of our customers.

Now this is something I can understand as a continuing method of improving public relations, because it rests solidly on my understanding of people as individuals and not as groups.

I do not understand people in groups and, frankly, I doubt if anybody else does either.

I hear about the average 12-year old intellect to which all public relations programs and gimmicks must be geared. I witness the results of this theory in radio and television commercials as well as newspaper advertising. Again, I find myself going in circles because of my misshapen foundation. Like the Idaho Side-Hill Gouger, I will never make it to the peak where, ostensibly, one may view all sides of the art of public relations.

Individuals Comprise 'The Public'

But I do take solace in the fact that a far more experienced man than I has reiterated publicly a truth about the public being composed of individuals. Knowing Kinsey, I'm sure he didn't mean for each of us to run out for a friendly chat with consumers about the weather. I'm sure that, in the back of his mind, he had some concept of an orderly approach for developing a program suitable to his company through employee contacts with individual consumers!

He hasn't said what his program will be. But the important thing about it is the radical change it suggests.

The unique thing about all this is that, for the first time (in a very long time indeed), an outstanding leader in the privately owned utility business virtually has placed a large part of his public relations activity into the laps of those who presume to know something about the public as individuals—and not as groups, or as averages!

Flooded by Techniques

Do you realize that this hasn't happened since that short period between the end of the notorious "public be damned" era and the beginning of the flood of mass-produced pseudo-scientific public relation techniques—all of which were adroitly immunized from any accountability as to results?

Why is it that the group therapy process for improving public relations always has been measured by the group therapists who put out the malarkey in the first place?

If all this is to undergo a change for the better, then those utility employees who claim to know something about individuals should hereby accept the challenge. Let's have a small look at how such a face-to-

face program may find its maximum possibility of success:

At the risk of over-simplification, let me state that I have never read or heard what I considered a proper definition or statement of the privately owned public utility consumer-relations problem. In the area of acceptable logic we must agree that a problem properly stated or defined is a problem often solved. Conversely, that without a clear statement of a problem no solution is possible.

The group therapy boys make one erroneous assumption after another in stating the problem, and often ignore Baruch's admonition that "every man has a right to his own opinion, but no man has a right to be wrong in his facts."

For example, they frequently have assumed that a consumer with a complaint, or one who feels that he has suffered at the hands of a representative of the XYZ Power Co will quite automatically, think, speak, and vote against the interest of the XYZ Power Co. Likewise, they infer that if the historical wrong is "righted," the consumer will, ipso facto, think, speak, and vote in favor of the interests of the XYZ Power Co.

Questionnaires Don't Tell All

Another common error is the assumption that whenever a consumer is found by the application of a group questionnaire test to possess an ideological belief amicable to the interests and aims of XYZ Power Co, he will automatically extoll the business practices of XYZ Power Co and be willing to abide relatively poor service without requiring special attention or individual therapy.

The most common and perhaps the biggest error in the premises on which the group therapy boys have based their hydra-headed definition of the problem is a corker! This one involves the belief that a customer found (by questionnaire) to be neither especially happy nor unhappy with the company service, but who definitely believes strongly in private enterprise as it applies to his business and that of his neighbors, will automatically believe in and fight against the socialization of the electric utility industry in America!

These premises are erroneous because the individual is not that simple, never was that simple, and never will be! Believe it or not, there are employees of privately owned utility companies who experience no moral or intellectual conflict at all in being loyal to the company in their way—and at the same time still harbor a strong feeling that they believe in the socialization of utilities in general!

The 'Fringe' Is Forgotten

The properly trained and clear-thinking employee is understandably aghast at such a paradox! So is the public relations manager. But this little problem is often disposed of by displaying the bell curve constructed from questionnaire findings and relegating the particular case in question to the fanatical 10% fringe on which the group therapy boys advise wasting no time whatsoever!

Well, I don't know exactly, but I think you must agree with me that some of these 10-percenters are the ones who are really giving us the old biz in our neck of the woods! If anyone doubts this they can ask Tom Roach of Idaho Power and Hells Canyon fame! Let's all hope that we can begin to "waste" some of our time on them!

However, let's try to waste it as intelligently as possible by casting out the errors of the past and holding on tightly to the good things that have come out of the group therapy experiment. There are some good things, I must admit, but we need not discuss them here. Rather, let's try to recognize what the individual approach has to offer.

One of the forces consistently found within the individual is his strongly conditioned sense of fair play. This need to support fair play and the need to satisfy a sense of justice is created in childhood. Fortunately, it is a dependably strong trait.

Another strong trait, that we should use in formulating our face-to-face program is the individual consumer's conditioned need for approval—and its companion, the need to avoid disapproval! One can only ask: How many public relations programs were ever designed to supply genuine recurring appreciation or approval to the individual consumer?

A third trait, as you know, is the consumers' need for a feeling of security and well being!

By recognizing and honoring these three forces, as well as others within the individual, it is possible, with a little imagination, to build a face-to-face program of public relations that will come closer to improving consumer understanding than anything I have seen so far under the group therapy treatment!

To use these primary paths through which consumers can be enriched with understanding, we must first know in our own hearts what is right. When we go to the individual "through the hearts of our employees," as some in the industry have stated, we must continue to make doubly sure that every shred of that which we profess is true and uncomplicated.

For instance, is it not the simple truth that the preservation of the electric utility business as a non-politically controlled but lawfully regulated part of our economy is one of the most positive means, if not the only means, of insuring that the business of the individual consumer can be protected from whatever foreign or domestic conspiracy should seek to take it from him?

A Weapon of Truth

The relationship of every kind of private business in America should be plotted into the simple architecture of this basic protection. This is but one of the simple weapons of truth that should be custom-forged for the army of utility industry employees to use, whenever they are made ready to fight the foe. Of course, a large part of them haven't even been asked to join the army yet!

Let me tell you a true story:

Once upon a time in England the utility business turned over all of its appliance sales and servicing to dealers. The dealers were very happy with the arrangement and professed a close working relation-

ship with each other and the utility company.

Secretly, however, some dealers began to resent this relationship because of minor inconsistencies in the interpretation of agreed policies and the rules of competition. When the question of government ownership arose, many of the dealers had already declared their independence from the utility companies, so to speak, by giving poor service and shoddy workmanship to the consumer in return for unusually high prices.

All of this reflected unfavorably upon the utility company in the eyes of the consumer when he compared it to the type and cost of appliance service rendered by the utility company before it turned the business over to the dealers. The utility tried to point this out to the dealers through group meetings and the usual media.

The questionnaires used in testing dealer understanding and loyalty were deucedly clever, don't you know! The dealers went merrily the other way though, because the Socialists had made a special promise to the dealers that they were not interested in nationalizing or socializing the appliance sales and repair business!

And Then . . . The Axe!

Less than 60 days after the nationalization of the electric utility business in England, government display cases were filled with the latest appliances priced far, far below what the dealers could sell their merchandise for and make a profit. In one memorable, emotion-packed month the dealers and repair shops were nationalized or forced out of business.

Is there a moral to this true story for some segments of our industry?

Do you suppose, as in this example, that where the members of our industry cannot be invested with loyalty and understanding by the group therapy approach, that the public can?

Do you suppose that a sampling questionnaire will show us the sly defections caused by ignorance, misplaced trust, calumny or greed?

Will an advertisement poll ever be able to tell us what the reader thought?

Those are the questions we must answer.

7 Tips on Making Ulcer-Free Decisions

Are ulcers the trademark of the modern executive?

Not necessarily. Although making decisions day after day unquestionably puts a strain on the stomach, the executive can pretty much call the turn by regulating the way he makes decisions.

The tips on ulcer-free decision making presented here were picked up by a correspondent in a large number of interviews. They don't come from medical experts. They come from a better source—the business men who make decisions every day. Here they are:

Don't put it off. Decisions have a way of becoming harder to digest the longer they are pigeon-holed. The most serene managers, as well as the most successful, cultivate a decisive frame of mind, which allows them to waste little time and energy in deciding when to decide.

But shun the snap decision. Do not confuse failure to investigate the problem with decisiveness. Having tackled a problem, it pays to take the time to gather the facts. Decisions which the executive is forced to make on the spur of the moment are few, and almost invariably those are the ones which bring him grief.

Consult and check. No one possesses the mental facilities to make a perfect decision every time. The more a manager uses the thinking power of others in the organization, the greater is his executive value.

Learn to compromise. Select the best features of each alternative. To drive ahead on a fixed course is to invite self-doubt later on. It is preferable to see both sides of any question while there is still time to weld several solutions together into a unified whole. The executive who considers and compromises will have fewer decisions come back to haunt him in the future—and a man who carries a number of such "haunts" on his back each time a new decision is to be made is a promising candidate for a rest home.

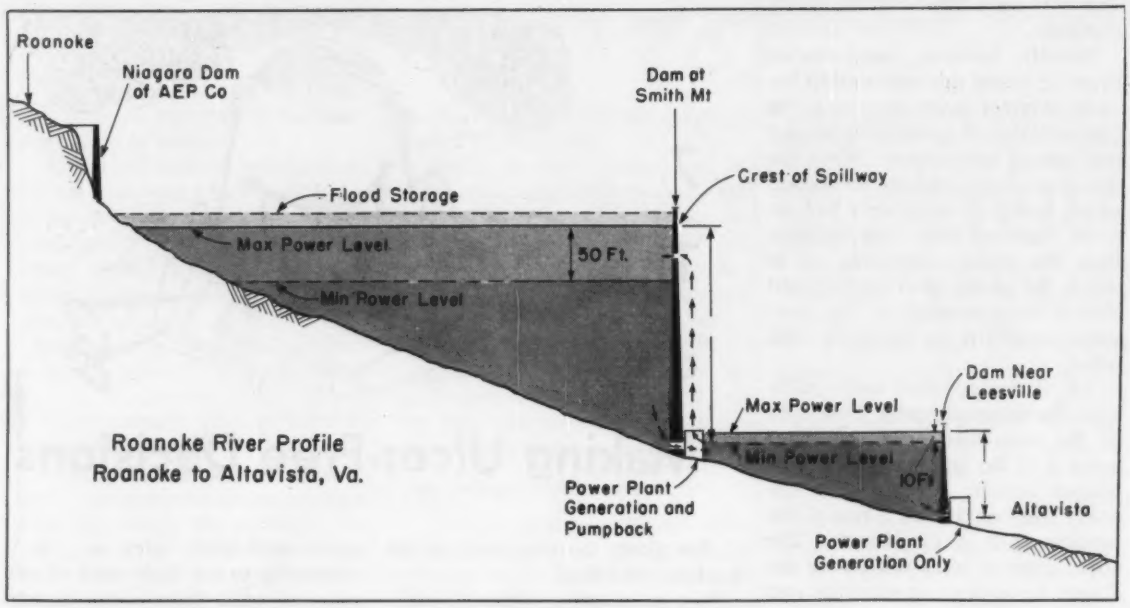
Don't fear failure. Worry about it is the number one cause of mental and physical strain on executive jobs, and it leads to nothing but disaster in the long run. No good decision can ever be made when this cloud hangs over one's desk.

Don't try to anticipate all eventualities. Some things must be left to chance. Good decision making calls for some anticipation of end results, but the executive who tries to foresee every tiny and remote possibility only burdens his thinking processes unnecessarily.

When you've made the decision final—forget it! Mulling over the question of whether or not the right course was chosen merely shortens tempers and fingernails—and to no purpose. It may be possible to retrace steps in an exceptional case, but almost invariably the decision, good or bad, must stand.

These tips show the way to management without ulcers—and there's a bonus.

The executive who applies them will probably find they also lead him to sounder decisions.



Appalachian's Smith Mountain plan finds . . .

Pumped Storage to Up Kw Output

The latest pump-storage plan advanced by electric utility companies in recent months has been proposed by Appalachian Electric Power Co.

The utility, headquartered at Roanoke, Va., received Federal Power Commission's approval to raise the maximum development of its Smith Mountain project from 60,000 kw to 250,000 kw. The company filed last fortnight with the Virginia State Corporation Commission for a construction permit.

Summer Is Target Date

Construction of the $20-million primary Smith Mountain dam and power plant may get underway sometime this summer. Appalachian has secured a site near Leesville for the secondary dam to store water for pumping. This site is about 17 miles downstream from the 235-ft high upper-level dam, which will double as the upper reservoir for pump storage operation.

Located some four miles above the mouth of the Pigg River, the primary dam would create a storage reservoir 38 mi upstream with more than 1-million acre-ft capacity. The 90-ft lower dam would provide about 100,000 acre-ft water capacity.

Said G. L. Furr, Appalachian vice president and general manager: "The enlargement of the Smith Mountain development offers a number of advantages over the original plan for a single dam. It has been recognized that there is only a marginal economic justification for a single dam . . . due to the relatively small stream flow of the river which limits the amount of power that can be generated."

Co-op Bid Sidelined

Besides the preliminary FPC approval, the company got a favorable ruling on a petition to intervene in the Southside Electric Cooperative's proposed application for a hydro development permit downstream from the company's project.

The plan also depends on agreement between the company, three affected counties, and the State Highway Commission on relocations of roads and bridges. Furr said he is hopeful this barrier will be removed in the near future.

The company has been negotiating for abandonment of certain secondary roads and bridges in connection with the project.

The boards of supervisors in counties of Franklin, Bedford, and Pittsylvania have passed measures to abandon certain facilities, the company said. And the Virginia Highway department has concurred with actions of the three boards.

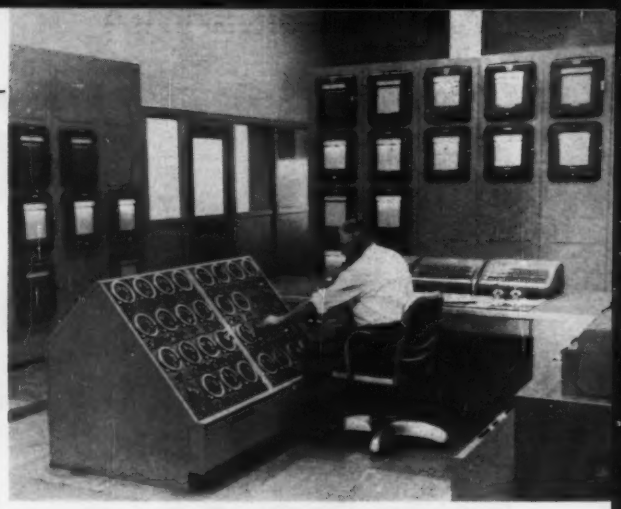
Further action depends on decision of the courts in appeals contesting the road and bridge abandonment in two counties.

The other recent pump-storage proposals include a 75,000-kw plan announced by a General Public Utilities Corp subsidiary, New Jersey Power & Light Co. Tennessee Valley Authority's Hiwassee Station began producing 58,000 kw in 1955 with the world's largest reversible pump turbine.

Pick-Up in Pump-Storage

These developments followed by some 30 years the first major U. S. pump-storage project put into service by Connecticut Light & Power Co at Rocky River. This reawakened interest comes at a time when European utilities also show increased interest in pumped storage.

Dispatch Computer for West Penn Proves Its Worth



Electronic unit saves $50,000 annually in dispatching of 1,500-Mw system

W. H. OSTERLE, West Penn Power Co, Cabin Hill, Greensburg, Pa.
R. B. SQUIRES, Assembled Switchgear and Devices Dept, Westinghouse Electric Corp, E. Pittsburgh, Pa.

Performance of the economic dispatch computer (EDC) built for West Penn Electric System has matched the hopes of its designers. With over a year of operating experience behind it, EDC has demonstrated savings of $50,000 annually and has produced a greater interest in getting better results through economic dispatch. Availability of the electronic device has been good, with less than a 0.7% average forced-outage time during the first 8 months.

The $50,000 saving is based on a detailed digital computer evaluation of operations before and after installation of EDC. The study also showed the way to greater savings—equipping more generating units for load-frequency control. EDC permits quick determination of the value or worth to West Penn of interchange power for purchase or sale in any amount. Considerable attention now is paid to proper dispatch and better basic information has been developed.

The dispatch computer proportions total system generation among individual stations to arrive at the most economical cost of delivered power. It requires manual setting in of pertinent data by the system dispatcher, who then communicates resulting loading data to individual station operators. Now that the computer has proven itself, the next logical step is to let EDC control station loading automatically. The dispatcher would need only to set station limits to meet local conditions and determine the desirability of economy interchange.

EDC is an electronic analog device designed for simultaneous solution of coordination equations covering 20 generating and tie-line points and spares. These equations combine station production cost with transmission cost to give delivered power cost, all on an incremental basis. Costs reflect the characteristics of the West Penn Electric System as shown by the statistics on pg 57. An analog method for solving these coordination equations, developed by Westinghouse engineers, was the basis for design of EDC, which was developed jointly with West Penn engineers.

Design for System Needs

West Penn Electric System comprises three principal operating companies—West Penn Power, Monongahela Power, and Potomac Edison. The system has many combinations and vintages of generating units. Individual station costs vary with particular combinations of units. Some stations generate non-incrementally for area protection for a time, and then may operate at their economical outputs. These situations common to most growing systems were recognized in the computer design.

Given station costs, loss-formula coefficients (B constants), and desired total generation, the computer determines the most economic dispatch for each station. Computer elements for each generating station represent each group of terms in the coordination equation by voltages. These are applied to an electronic amplifier to get an output proportional to the algebraic sum of the voltages. This output voltage drives a small servomotor, whose shaft position is proportional to the station's power.

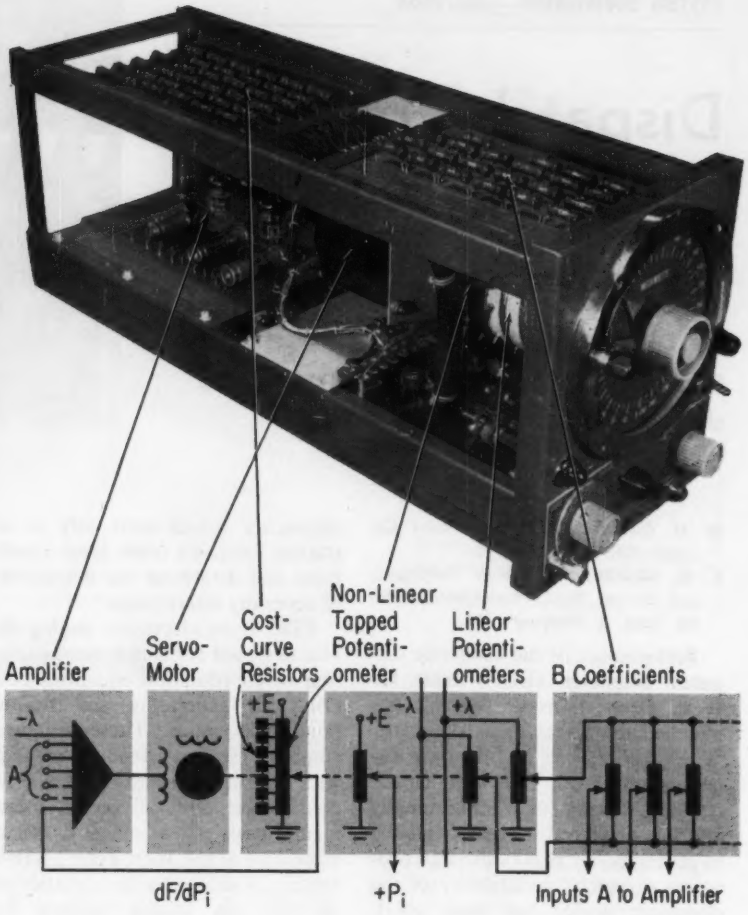
Necessary voltages are generated by four potentiometers on the servomotor shaft. Incremental production cost voltages from each station servo are fed to 20 potentiometers which set in 20 different B coefficients. Thus, 400 potentiometers represent the loss characteristics of the West Penn system. Output of each potentiometer is a positive or negative constant multiplied by the incremental production cost for each station. Each quantity is directed to the appropriate amplifier for the desired station.

When the algebraic sum of voltages to the amplifier is zero the motor stops, the equation is satisfied, and the unit is in economic dispatch. Because shaft rotation is proportional to station power when it is in economic dispatch, power may be indicated by a pointer attached to the shaft. This pointer moves freely between adjustable upper and lower limits, set by two arms and knobs on the dial associated with the pointer.

Select Cost Curve

Resistors that control incremental station cost curves are mounted on removable printed-circuit cards in the top of the computer. Any of five cost curves can be selected by a switch on the front of the main panel. A knob on the panel inserts a multiplier into the unit's produc-

VARIABLE FACTORS are entered into front of station element. Cost factor is multiplier for any of five cost curves



STATION ELEMENT produces voltages representing production costs and enables B matrix to compute voltages representing line losses. When net voltage to amplifier is zero, station load for economic dispatch is indicated by pointer attached to servomotor shaft

tion costs to represent variations in fuel prices and unit efficiencies.

EDC is installed at the system dispatching center in Charleroi, Pa., where dispatching for all operating companies is done. Computer external design and arrangement were dictated by operating needs of the dispatcher and layout of the dispatching office. The left-hand cabinet with all controls displays all the information necessary to dispatch the system most economically.

The section in front of the dispatcher contains equipment requiring only infrequent adjustment and serves as the dispatcher's desk. Equipment height was kept low so that the dispatcher can observe recorder charts to his left and front. The 42-deg sloping front of the left-hand cabinet best displays all dials and controls whether the operator is seated or standing. A similar sloping-front cabinet to the dispatcher's right houses master load-control equipment. The U-shaped layout places all equipment within easy reach, as required for best operation.

System load changes are indicated by the totalizing meter, tie-line flow, and load on stations selected to hold ties at a certain value. An increase (or decrease) is factored into the computer by turning a knob until the computer's total power meter reads a value equal to total system power. This knob raises system λ and causes all generators not at their upper limits to increase generation.

Dispatcher Calls Stations

With the required value of total power on the meter the dispatcher reads off the new power setting to be dispatched from each station and calls all affected stations. Then index pointers are reset to agree with power dispatched from each generating station. This change (in the computer) returns ties to predetermined values and brings regulating stations in range.

To reapportion system load, as in the case of a station having to reduce load when a unit is removed from service temporarily, this procedure is used. Upper limit on that station's computer element is reduced to the maximum load permitted. Any drop in load by this station will be absorbed by variable stations to maintain the required total. The dispatcher calls the new settings to the stations involved and changes the index pointers.

EDC has proven its worth in aiding the West Penn dispatcher to buy or sell exchange energy on the most economical basis. This is the way it works. Interchange with neighboring utilities is arranged at 15 min before the hour. Assume another system will have 20 Mw available for the coming hour at a cost of 2.0 mills per kwhr at the tie. The

West Penn dispatcher meters this tie line on the cost meter of the computer. Worth of energy at the tie under the present condition of interchange is 3.0 mills.

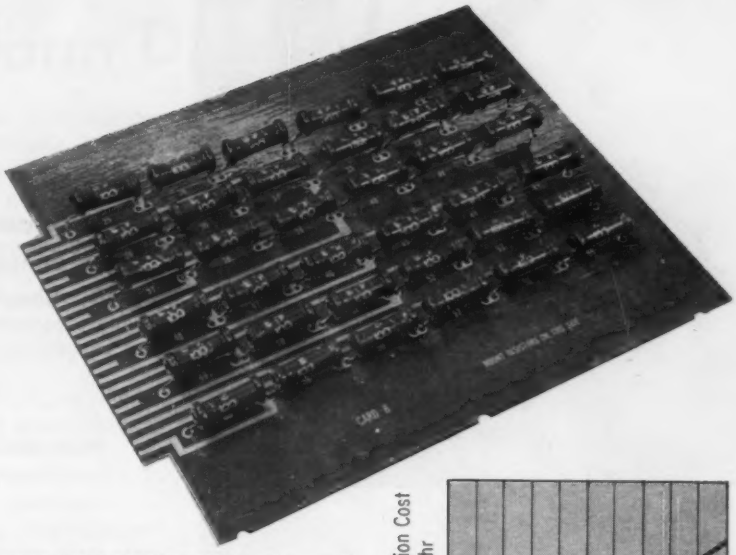
The dispatcher then sets tie-line power at 20 Mw "in" and readjusts total power to agree with actual total system load. This drops 20 Mw from the generators in the West Penn system. Worth of energy at the interchange point now reads 2.8 mills. This means that average worth for the 20-Mw increment is 2.9 mills. Thus the dispatcher can operate more economically by buying the 20 Mw. Under a split-savings agreement, this energy will be bought for 2.45 mills per kwhr.

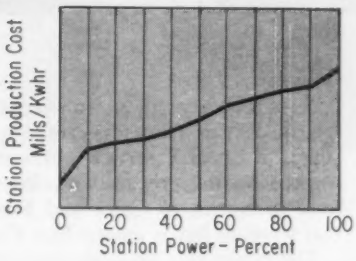
Determines Selling Price

If the worth of West Penn power at the tie is below the worth to the neighboring utility, the dispatcher can sell power, using the computer to determine the selling price. Also, the computer can be adjusted to meet an expected increase on the West Penn system during the coming hour, as this will undoubtedly affect the worth of power at the tie.

If another generator in a station must be put on the line, the dispatcher changes the cost curve in the computer station unit and increases the upper limit to reflect the added capacity and its incremental cost relation. This change readjusts the load carried at that plant and in other variable plants on the system. As total system load increases, the dispatcher increases total load on the computer. Lower-cost stations will hit their maximum stops and remain at that point; higher-cost stations will leave their minimum limits only as delivered power cost to meet required system total load becomes high enough.

Fuel costs are computed periodically to show seasonal and district changes in prices, and effect of changes in operating conditions, such as cooling water temperature on plant efficiency. If the fuel price increases 2% at a given station, the dispatcher changes the cost factor dial on the station servo drawer from 0.97 to 0.99. This change is verified by setting the servo representing the station at two power levels and noting the incremental production cost on the power meter. The fuel-cost multiplier dial then is locked against turning until another price adjustment is necessary.





COST-CURVE RESISTORS combine with a nonlinear potentiometer in the station element to represent the station's nonlinear cost curve. Resistors are grouped and tapped so that any one of five station cost curves may be selected simply by turning a knob

The hydro station on West Penn's system can be handled on the computer in several ways. Often it is used in load-frequency control to keep frequency and tie-line loadings at scheduled values. The hydro station element is set in the middle of the band over which the unit will regulate.

The hydro station also is used in economic dispatch by assigning to its energy a cost value which does not vary with power output, so that the computer will just use the available water in the time period. Hydro generators will come on during times of high-cost operation and go off during low-cost periods. If water still is available, the dispatcher can reduce the cost value so that hydro generation comes on sooner and stays on longer.

During the time EDC has been in service at Charleroi, electronic tube failures have been so small as to obviate a tube replacement program. Computer-forced outages for the first 8 months averaged less than 0.7%. Arranged outages, resulting from scheduled maintenance, changing of constants, etc, averaged 2.7%, for a composite average outage time of 3.4% during 8 months.

Vital Statistics of West Penn Electric System

Area	29,000 sq miles
Peak Load	About 1,500 Mw
Transmission, miles	About 1,650
Voltage	132 kv and 66 kv
Steam stations	11 (major)
Size range	39 to 457 Mw
Hydro station	52 mw (1 station)
Fuel cost range	12 to 28¢ per million btu

Detroit Edison

Major Disaster Manual creates 51 self-sufficient zones, provides for importing line crews: Simulated disaster proves out plan

PLAN BOOK is shown by John Paull, disaster plan coordinator. The 432 page manual has 20 sections

Next time a major storm sweeps into its service area, Detroit Edison Co will be ready. For more than two years, a special service restoration committee has worked on the preparations, inspired by the not too fond memories of Carol and Edna, those hurricanes that wrought havoc among East Coast utilities in 1954.

The committee drew on the company's experiences in its own area and on those of its crews dispatched to assist in emergencies elsewhere. It has evaluated and coordinated this information and planned for the cooperative action of various departments. It has established operating procedures and training programs to make those procedures effective. All this has been spelled out painstakingly in a 20-section, 432-page Major Disaster Manual.

The basic plan is to keep service restoration as routine and orderly as practicable. The manual specifies the steps for insuring prompt assembly of personnel, fast and accurate appraisal of the magnitude and nature of damage, and a quick estimate of the time, materials, and personnel for repairs.

The company's 7,600-sq-mile service area has been partitioned into 51 storm service zones, each with its own emergency field headquarters, supervisory staff, and supply depot. This scheme for decentralized action is intended to speed up the dispatching of crews and material to stricken areas.

Although responsibility for the bulk of any service restoration program necessarily falls on the overhead lines group, the company has readied many employees of other departments for assisting roles. These will act as storm damage evaluators, escorts, and coordinators.

AUXILIARY LIGHTS are included in disaster kit for use in pinpointing the "trouble calls" as they are reported

OVERHEAD LINE ESTIMATOR changes postings on damage evaluation board as radioed field reports note customers hit

Readies for Storm Disaster

Their assignments will be with a view to freeing the overhead lines department for line restoration.

Personnel from other departments will take care of meals for line crews, and will meet and guide the crews of other companies. Provisions in the manual call for:

1. Subdivision of the service area into the 51 storm service centers from which work crews will be dispatched.

2. Training and pre-assignment for emergency duties of the necessary personnel from all company departments.

3. Assignment of department and local area administrative groups for the coordination of service restoration.

4. Standardization of damage appraisal procedures in both preliminary and final damage evaluation.

5. Uniform procedures for ordering, allocating, and shifting crews, including loan crews from other companies.

6. Procurement of emergency feeding and housing for workers.

7. Establishment of temporary supply depots in emergency areas.

8. Standardized procedure for obtaining information and communicating it to the press, public officials, and customers on the extent of damage and progress of restoration.

Patrol Grids Established

The manual provides for subdivision of the 51 emergency areas into patrol grids to each of which a man is assigned. When the alert is given, a damage evaluator will report to his assigned emergency area headquarters. From there he will patrol his assigned grid on foot or by car, assessing damage as he patrols. He will be expected to report within 2 hr to his emergency field headquarters, giving a preliminary estimate of damage. From this report, area headquarters personnel will determine the crews and materials needed. Later, he will report more fully.

The manual has been issued to key personnel throughout the company. Separate sections on specific assignments have been issued to several hundred employees who have disaster organization assignments. One section under separate cover presents pertinent information and outlines special instructions for emergency crews from other companies.

Damage evaluators in the 297 patrol grids are expected to appraise damage quickly and report to the overhead lines report center in the general office. The center will then dispatch Detroit Edison crews and report to the disaster director and his staff. When help is required from other companies, the disaster director will request it.

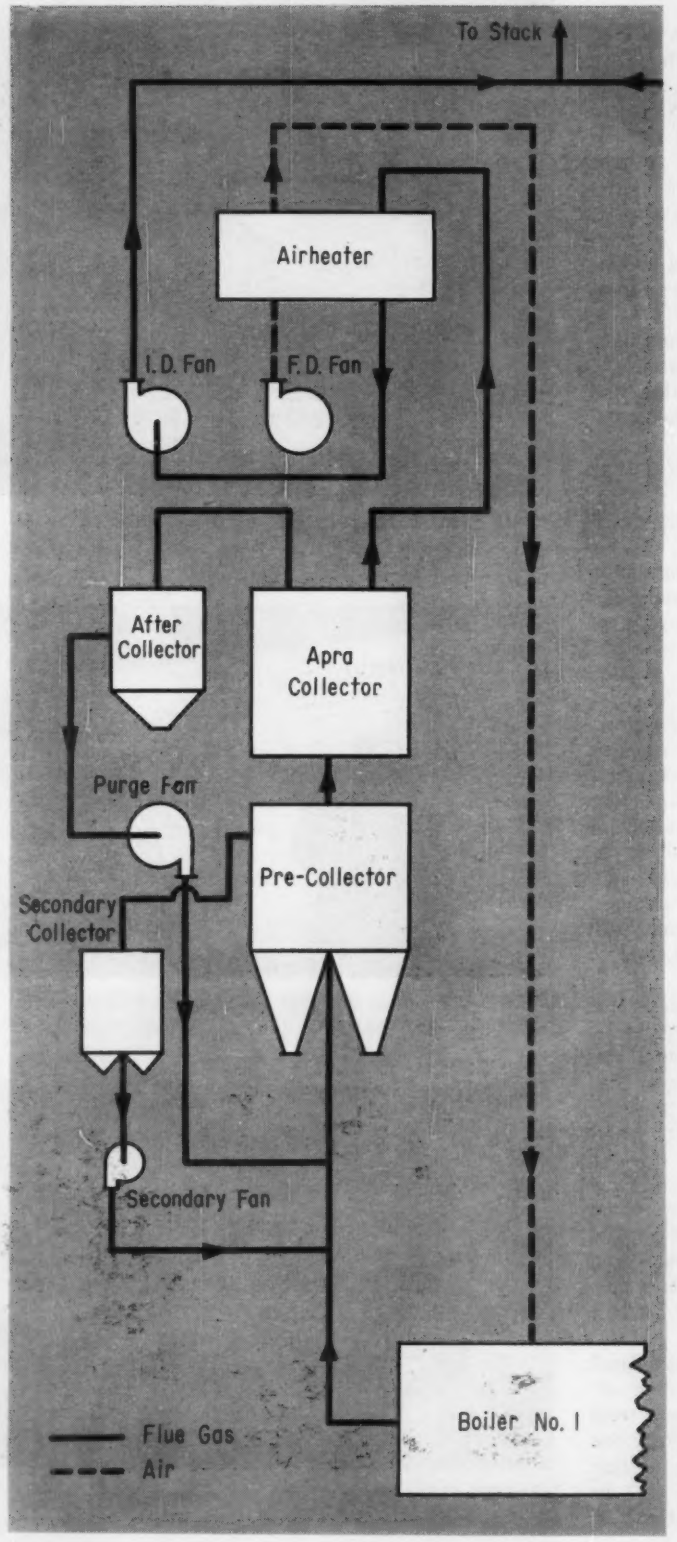
Recently, the plan was put into effect for a simulated "disaster." Some 10% of the system's distribution circuits were reported "out," and 110,583 customers were reported as having "interruption of service." Forty line construction crews were ordered from other utilities. Disaster Director W. W. Williams declared that he was well pleased with the way the plan worked.

STORM EVALUATOR KITS are distributed to area headquarters' captains whose reports are basis for dispatching

REPORTS are summarized and posted in overhead lines report center which dispatches company and imported crews

DISASTER PLAN was put into action quickly at Lapeer, Mich., district's emergency field headquarters in test

Better Boiler Efficiencies Are



The device, working on the electrostatic principle, will be placed ahead of the air preheaters. Collecting efficiency of 98.5% is expected when in combination with mechanical collectors

J. J. TRAINOR, Vice President, Public Service Co of Indiana, Inc, Plainfield, Ind.

Better boiler efficiency is offered by a new electrostatic precipitator which Public Service Co of Indiana plans to install in its New Albany station.

The newly developed dust collector, being used to date by only one other utility in the United States, enables power plant engineers to transfer more heat from stack gases to incoming combustion air. This boosts boiler efficiency.

Designed to operate in temperature zones of 560F to 700F, the precipitator is placed physically between boiler and air heater. In combination with conventional mechanical collectors, it will remove 98.5% of fly ash leaving the boiler in the flue gas.

The Apra collector, moreover, offers these additional advantages:

- Elimination of corrosion of precipitator parts.
- Collection of ash in the dry state, which eliminates plugging.
- Lowest ash resistivity.
- Continuous and complete cleaning.
- Minimum re-entrainment of ash into the main gas stream.

Aside from stepping up boiler efficiency, the technical significance of the new precipitator is its placement ahead of the air heater—the

◀ **THIS PHYSICAL ARRANGEMENT** represents one of two duplicate precipitator systems on each boiler. Note that the dust collector comes before the air heater, not after

Expected With New Precipitator

device which warms incoming air going to the boiler. Power plant engineers have been reluctant to cool the flue gas too much because of a consequent serious corrosion problem in the air heater.

Stack gases contain sulfur dioxide as well as fly ash. If at the air heater stage, too much heat is transferred from stack gas to incoming air, this sulfur dioxide combines with water vapor in the gas and condenses around the fly ash specks. The temperature at which this occurs is called the "dew point." The combination of sulfur dioxide and water vapor yields sulfuric acid, which will attack the air preheater and run maintenance costs up drastically.

So to avoid a maintenance headache, power plant engineers usually sacrifice maximum air heater efficiency to overall economy. Stack gases are permitted to escape while still holding heat that could be transferred to incoming air to improve boiler efficiency.

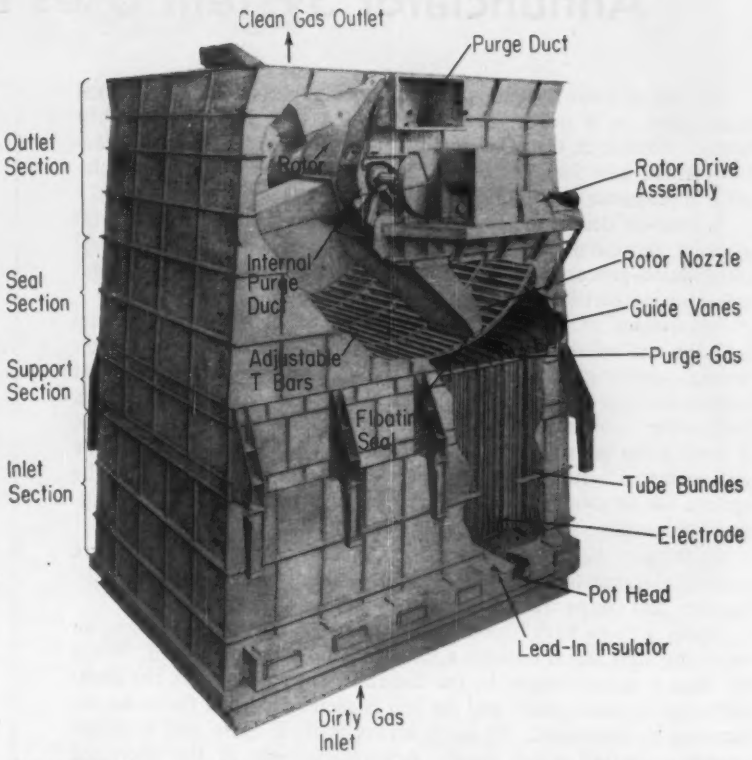
Placed Ahead of Air Heater

The new electrostatic precipitator, however, is placed before the air heater in the air-flow diagram. And by screening out fly ash ahead of the air heater, the precipitator thus removes the "seed" about which the sulfuric acid condenses and lowers the dew point.

At the high velocities that would be encountered at the new location the precipitator would ordinarily be unable to charge and trap fly ash particles quickly enough using conventional designs. Many would escape.

This problem was overcome through a new collector design. Stack gas moves through many narrow, long tubes. A charging electrode is positioned, conventionally, in the center of each tube. The tube itself serves as the catching electrode. The nearness of the two electrodes, in addition to guaranteeing entrapment of most fly ash particles, also permits use of a much lower potential difference across the electrodes.

The two precipitators for each boiler will treat 652,000 cu ft of gases per minute at 690 F, or 1,332,000 lb/hr. Treatment will occur in over 8,000 tubes of 3-in. dia at a gas velocity of 32 ft per sec.



CLEANING is accomplished by an enormous vacuum-cleaner-like device. Velocity of the cleaning gas in the collecting tubes is about 200 ft/sec

A 9-ft electrode will be suspended concentrically in each tube. The charged fly ash, passing through the tubes will move less than an inch across the gas stream to be collected on the tube walls.

Obviously the small tubes had to be cleaned frequently—and positively. This is accomplished by an enormous vacuum-cleaner-like device which purges each of the precipitator's 96 sections every two minutes. During this process, it generates a momentary gas velocity of 200 ft per sec in the tubes.

Chance of fly ash escaping the precipitator is minimized because the cleaning device is under suction.

At the New Albany station, the stack gas flow will follow the route illustrated in the accompanying diagram. Gas will leave the boiler and pass through the precollector to the dust collector. Strong flow of gas, induced by the vacuum cleaner type of purging equipment will sweep the particles into the after-collector. Ash not caught in the after-collector will go back into the gas stream leaving the boiler.

Each precipitator will have eight power supplies, which will provide 15,000 v dc to the electrodes for a corona discharge and consequent precipitation of the fly ash. This voltage will be transformed and rectified from a 480-v ac supply.

Each power supply will be fed by a three-phase air-cooled transformer, will have a selenium bridge rectifier and a reactor control, and will be precisely controlled to maintain peak performance. This will be accomplished by controlling the voltage automatically to the optimum sparking or flashover rate for maximum efficiency.

Annunciator System Uses Plug-in Elements

An annunciator system with no moving parts will get its first application in a utility generating station this year when Public Service Electric & Gas Co employs it to monitor 560 critical quantities in the new 580-Mw Bergen Station. The system uses modular plug-in magnetic elements rather than relays.

In over-all design the system is similar to industrial static control systems, but circuit components differ. This scheme houses several information-processing components in a single plug-in module, but standard industrial systems require several modules.

Advantages of this annunciator system result from the extreme long life and reliability of magnetic elements. It also provides better testing—pressing a single button puts all logic elements in an 80-point system through a complete cycle, including lamps, bell, and buzzer; low power consumption of 1 watt per monitor point on stand-by, 8 watts when lamp is lit; and inherent "memory" which enables the equipment to resume proper indication after a power outage. The system can be modified for normally open or normally closed operation by installing a different control module.

At Bergen, the system brings 560 inputs to the relay room where each of 7 cabinets houses a separate 80-point alarm system. Bells, buzzers, and lamps are in the control room, one floor above.

Under a "ring-back" modification specified by Public Service, an incoming alert signal initiates a flashing lamp and rings a bell. When the alert is acknowledged by the control-room push button, the flashing lamp becomes steady and the bell is silenced. When the cause for the alert is eliminated, the lamp begins to flash again and a buzzer sounds a second audio signal. Acknowledgment of the corrected condition returns lamp, bell, and buzzer to stand-by.

The basic design permits (1) lock-in operation to signal occurrence of conditions as brief as two cycles; (2) lamps that glow continuously at low candle power to permit spotting burnouts; and (3) operation without ring-back, with one audio signal only.

Circuit Operation of Static Annunciator System

A fault condition causes the initial input element to send a signal to A-1, B-3, D-2 and E-3. Unit A gates an output to ring the bell because it sees a signal at A-1 and not at A-2. Unit E gates a pulsating output to flash the light because E-2 receives a pulsating signal from the static pulser while E-1 and E-3 receive a steady signal. "Memory" units B and C and unit D do not function for this condition.

Acknowledging the fault by momentarily closing the "acknowledge" push button triggers memory unit B to gate an output, as signals are present at B-1, B-2, and B-3. This output triggers unit C with a signal at C-1. Unit C's output continues after the acknowledge contacts part because a signal is then present at B-1 but not at B-2. Unit A cuts off because of the signal at A-2, and the bell is silenced. Unit E

New Auxiliary Scheme for Large Units

J. C. WOODS, System Station Electrical Engineer, Commonwealth Edison Co, Chicago, Ill.

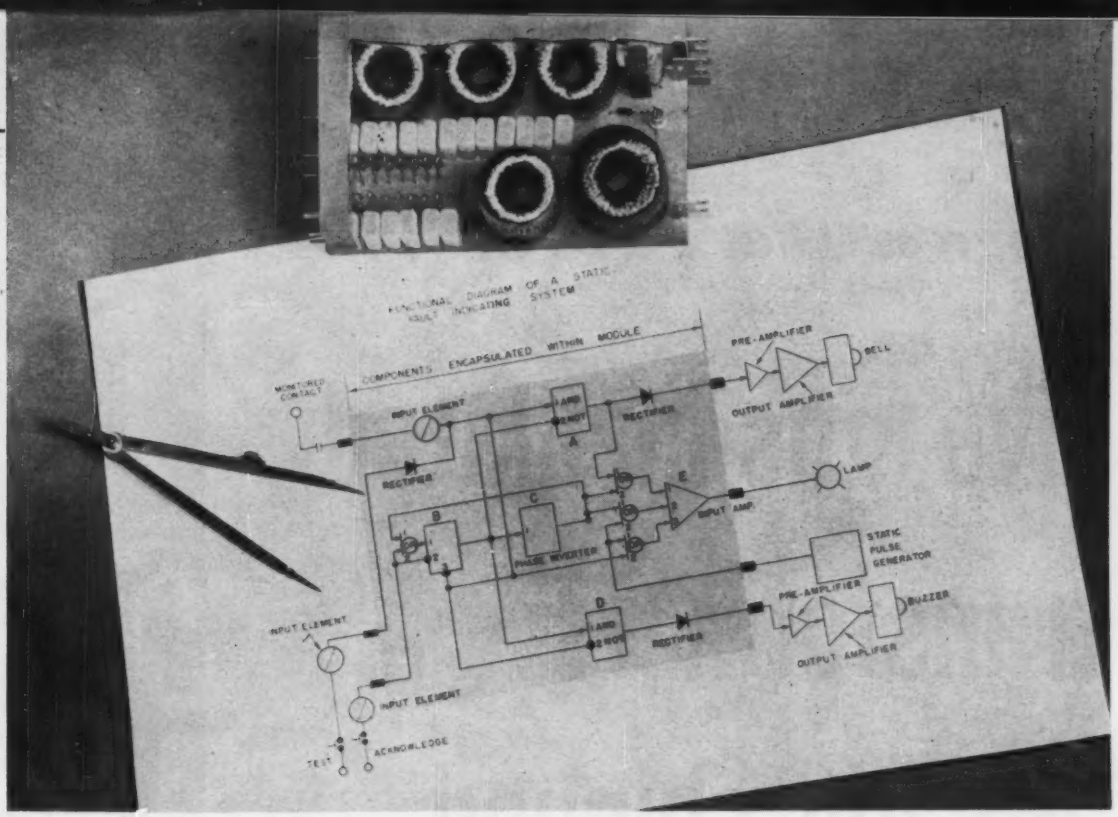
Dividing an auxiliary power system for a large unit into four bus sections avoids the complexity of load shedding and achieves continuing service to desired auxiliaries during the shutdown period following automatic tripout.

The reserve or start-up source is connected to two of these buses. These sections, in turn, are connected individually to one of the two remaining buses, which are normally supplied from the generator leads.

This scheme, using three transformers of the same capacity, permits the utmost flexibility in loading the reserve transformer as heavily or lightly as desired. It also permits uniform loading of any two of the three auxiliary transformers when one is out of service.

This scheme is a solution to the problem which has arisen with the increasing size of turbine generators, approaching the critical dimensions of available auxiliary power equipment at 4,160 v. Until recently, switchgear of this class has been limited to 2,000 amp and 250 Mva, which, in turn, limited transformer sizes to about 15,000 kva, with tolerable impedance values. Generating units of 350-Mw capability will have auxiliary power requirements of 22 to 25 Mva, requiring more than one such transformer to match the switchgear.

This has brought about the general use of two transformers supplied from the generator leads, with a third or start-up transformer supplied from the system. Large



gates steady output to make the lamp burn continuously because steady signals are now present at 1, 2, and 3; and unit D keeps the buzzer silent.

When the fault is corrected, unit D gets a signal at 1 from the memory units but not at 2 because the fault has cleared, so it sounds the buzzer. Unit E gates a pulsating output that causes the lamp to flash because a steady signal is present at E-1 and E-2 and a pulsating signal is impressed at E-3.

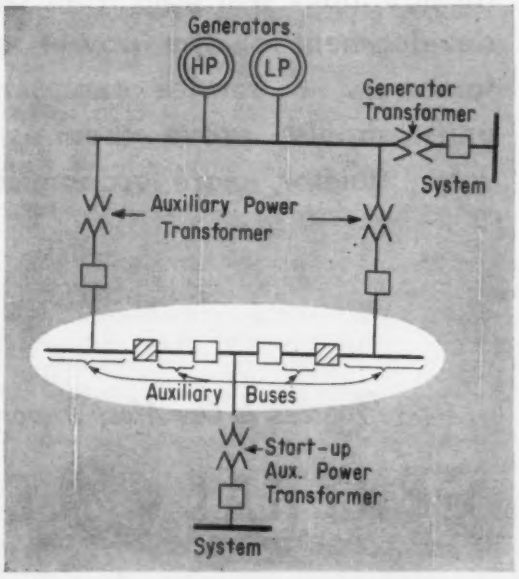
When the operator acknowledges that the fault is corrected, all outputs are turned off. Memory unit B shuts off when the acknowledge button puts a signal on B-2. This cuts off unit C and both memory units remain off when the acknolwedge button is released because no signal is present at B-1. The "alarm control center" is now ready to register a new fault.

This entire sequence can be initiated by depressing the test button. Closing these contacts duplicates all the operational consequences of a fault.

Avoids Load Shedding

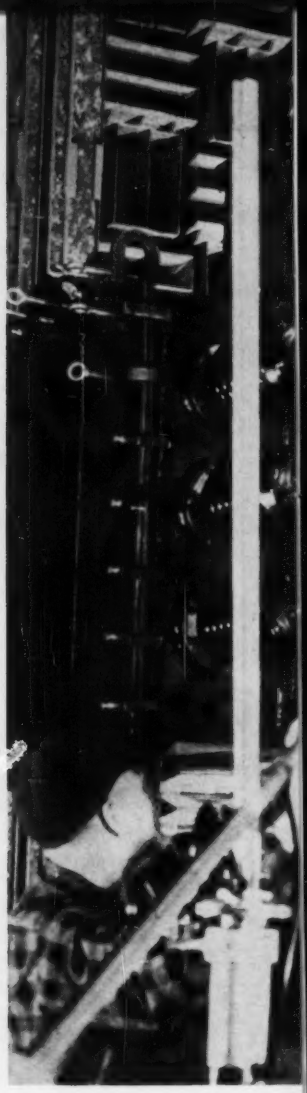
auxiliary induction motors with across-the-line starting have starting kva in the order of 30,000. With standard transformer impedance, this requires transformer capacity of 15,000 kva to avoid excessive voltage drop during the starting interval. It is not feasible to transfer automatically the entire load of such auxiliaries to a single transformer of this size.

Operators not willing to trip all auxiliaries during shutdown following automatic tripout have maintained automatic transfer schemes by load shedding or automatically tripping all but the predetermined auxiliaries. This can become a very complex control scheme, involving a large number of selective combinations to fit all operating conditions. The scheme illustrated here, however, avoids load shedding and achieves continuing service to desired auxiliaries.



Progress That Pays Off . . .

Five gas-insulated transformers already shipped or building



More utilities will gain from General Electric's development of the power transformers of tomorrow . . . service experience with these units should prove them smaller, lighter, safer, quieter, more economical to maintain.

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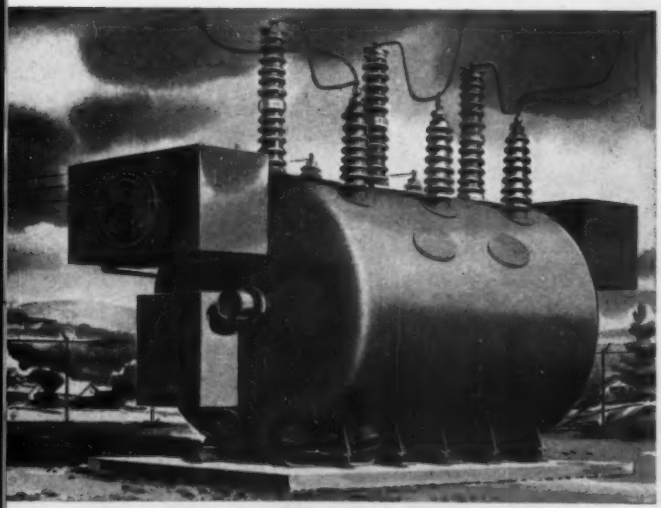
FIRST GAS-INSULATED TRANSFORMER (above) was shipped to Consolidated Edison of New York, Inc. in 1956. One of two identical 2000-kva, 69-kv units for installation in metropolitan New York, it signalled what may well be a new era in power transformer progress. Here J. W. Seaman (right), General Manager of General Electric's Power Transformer Department and G. Camilli, Supervisor of Advance Product Engineering, inspect unit on test in General Electric Sound Laboratory at Pittsfield, Massachusetts.



GAS-INSULATED TRANSFORMER, 10,000 kva, 69 kv, for Pennsylvania Power & Light Company, will incorporate many of the design advances made in just the past few months.

General Electric is now building three gas-insulated transformers for these pioneering utilities: a 9375-kva, 69-kv load-tap-changing unit for Houston Lighting & Power; a 7500-kva, 46-kv LTC unit for Detroit Edison; and the Pennsylvania Power & Light unit shown at left.

Progress pays off in extra value for you. As these units enter service, we're confident utilities will find them ideally suited to substation applications in growing urban and suburban areas. Here's why:

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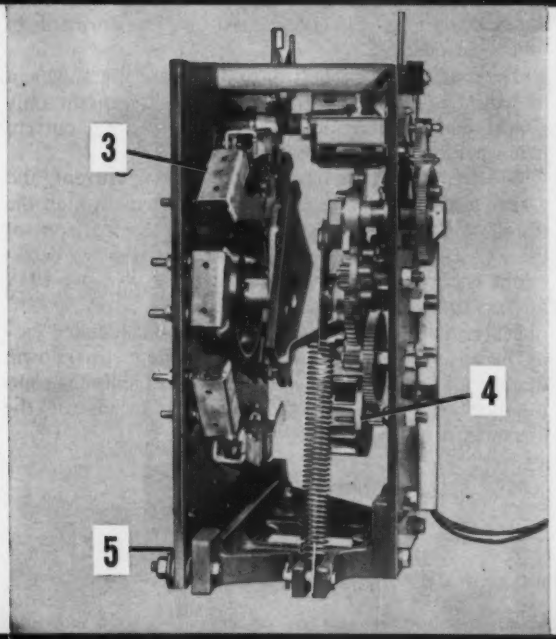
..... General Electric Regulators Cost Less On The Line



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4 **CONTROLLED SWITCHING SPEED,** provided by oil-immersed impeller on G-E optimum-life switch, extends switch life. The actions of the impeller and spring are coordinated to control switching speed, keep contact arcing to a minimum.

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Can You Afford Old Transformers?

Evaluation of operating units indicates:

1. Economies for obsolescence program
2. Pre-1919 units should be retired
3. Pre-1940 units don't warrant repair

A. B. **COYLE**, Product Manager, Transformers, Line Material Industries, Zanesville, Ohio

Savings and more efficient operation of distribution systems are possible through a program of distribution transformer obsolescence, or planned transformer retirement. Today's distribution transformer is much more efficient than a unit built years ago, having among improvements lower losses, higher impulse level, decreased exciting current, and greater life expectancy.

Many companies, with the cooperation of manufacturers, have programs for uprating old transformers, but have found that such uprating is often only a stop gap—a move in the right direction but only a partial solution. A few utilities retire old transformers, but no common formula is apparent.

Basically, a retirement program hinges on whether today's transformer is sufficiently superior to warrant such a program. If so, can replacement be justified for units installed and operating satisfactorily; or, can replacement be justified for units in for repair or changed out because of load growth?

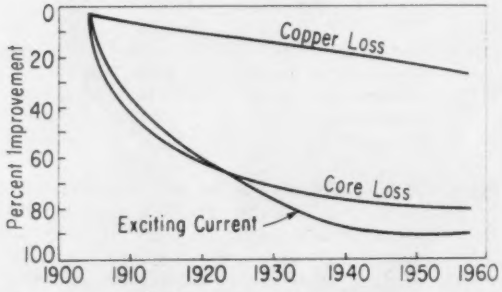

FIG 1—TRANSFORMER LOSSES have improved through the years as a result of new developments

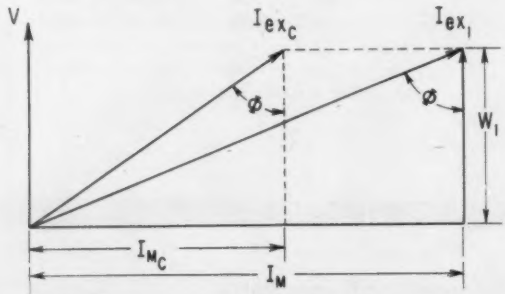

FIG 2—EXCITING and magnetizing currents can be reduced as shown by vectors, through capacitors

Transformer performance characteristics, shown in Fig 1, illustrate improvements since 1904. The curves are representative of the complete range of distribution transformer ratings available. Characteristics of 50-kva, 2,400/4,160-v transformers built during four different periods—1904 to 1919, 1919 to 1940, 1940 to 1956, and 1957 are given in the table on page 70.

Transformers manufactured before 1904 are not tabulated because relatively few are still in service. Transformers of the 1904-1919 period have two different sets of performance values—new and aged; losses increased because of the aging characteristic of the silicon alloyed core steel. Transformers of the 1919-1940 period have non-aging, hot-rolled silicon steel, but recent units have cold-rolled, grain-oriented steel.

Superiority of modern transformers is indicated in tables of performance values which can be used to compute economic advantages. Savings in core and copper losses may be considered first. A 1904-1919 transformer in service consumes 7,884 kwhr annually, but a 1957 transformer uses only 1,638 kwhr. These values are determined by multiplying the hours per year by core loss. Thus, 1957 transformers operate more efficiently and annually require 6,246 kwhr less.

In a similar manner, copper loss advantages can be determined by assuming a load factor. At 50% load factor, the difference in copper loss between a 1904-1919 transformer and a 1957 unit will be 858 kwhr. At 7 mills per kwhr, the total annual savings for reduced core and copper losses would be $49.72. Similar calculations can be made for transformers of other periods.

These savings although substantial, are not sufficient to justify a retirement program. They represent only a part of the economic justification, exciting current being a factor still to be considered.

Older transformers have higher exciting current, and a reduction of such values can be effected through the installation of new transformers. A comparison of these costs can best be shown by comparing the determined energy costs for magnetizing losses in a pre-1919 50-kva transformer with today's.

Magnetizing losses in kilovars can be calculated easily because core loss and exciting current are known. Placing all factors on a percentage basis facilitates computation. Calculations are made by means of the formulas:

$$W_1 = \frac{W}{P_a \times 10} \text{ percent}$$

$$I_m = \sqrt{(I_{ex})^2 - (W_1)^2} \text{ percent}$$

$$P_m = I_m \left(\frac{P_a}{100} \right) \text{ kvar}$$

in which

W_1 = core loss in percent
W = core loss in watts
P_a = rated capacity in kva
I_{ex} = exciting current in percent
I_m = magnetizing current in percent
P_m = magnetizing losses in kilovars

(*Continued on page* 70)

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Using the values for a pre-1919 transformer:

$$W_1 = \frac{900}{50 \times 10} = 1.8\%$$

$$I_m = \sqrt{(11)^2 - (1.8)^2} = 10.82\%$$

$$P_m = 10.82\left(\frac{50}{100}\right) = 5.41 \text{ kvar}$$

Similarly for a 1957 transformer:

$$W_1 = \frac{187}{50 \times 10} = 0.374\%$$

$$I_m = \sqrt{(1.2)^2 - (0.374)^2} = 1.14\%$$

$$P_m = 1.14\left(\frac{50}{100}\right) = 0.57 \text{ kvar}$$

Thus, magnetizing losses in a pre-1919 50-kva transformer are nearly ten times those in a 1957 unit. If an energy charge of $.007 per kwhr is assumed, additional annual operating cost is (5.41-0.57) (24) (365) (0.007) = $296.78, the annual savings afforded by a 1957 transformer for magnetizing losses alone.

Magnetizing losses and their annual costliness can be reduced somewhat by primary capacitors. The correction would be as shown in Fig 2. Magnetizing and exciting currents would be reduced appreciably while core losses would remain the same. To reduce magnetizing current of a pre-1919 50-kva transformer to the level of a 1957 unit, the following additional formulas would be used:

$$\cos\phi = \frac{W_1}{I_{ex1}}$$

$$I_{ex_c} = \sqrt{(I_{m_c})^2 + W_1^2} \text{ percent}$$

$$\cos\phi_c = \frac{W_1}{I_{ex_c}}$$

$$P_c = \frac{W}{1{,}000}(\tan\phi - \tan\phi_c) \text{ kvar}$$

in which

ϕ = power factor angle originally
ϕ_c = power factor angle after correction
I_{m_c} = magnetizing current in percent after correction
I_{ex1} = exciting current in percent originally
I_{ex_c} = exciting current in percent after correction
W_1 = core loss in percent
W = core loss in watts
P_c = corrective kilovars required.

Therefore:

$$\cos\phi = \frac{1.8}{11} = 0.1635 \therefore \tan\phi = 6.0405$$

$$I_{ex_c} = \sqrt{(1.14)^2 + (1.8)^2} = 2.14\%$$

$$\cos\phi_c = \frac{1.8}{2.14} = 0.842 \therefore \tan\phi_c = 0.6395$$

$$P_c = \frac{900}{1{,}000}(6.0405 - 0.6395) = 4.86 \text{ kvar}$$

At an installed outlay of $11.37 per kvar for primary 5-kv switched capacitors, the cost of correcting magnetizing current would be $55.26.

Total savings accruing through use of a 1957, 50-kva transformer, as compared to a pre-1919 unit, is $49.72 + $296.78, or $346.50. These savings alone would completely pay for a 1957, 50-kva transformer in less than two years. Thus, the retirement of pre-1919 transformers in service appears to be economically justifiable.

When capacitors are used, the savings will not be so great. It would still cost $49.72 for the greater core and copper losses, and the capacitor amortization charges would have to be added to arrive at the annual charges. Even with corrective capacitors, exciting current of the pre-1919 transformer remains at 2.14%, or nearly twice the level of 1957 transformers.

These economic calculations, although impressive, are only part of the justification for retiring old transformers. Many other benefits of today's modern distribution transformer are important factors.

Inhibited transformer oil in modern units assures longer life. With improved insulating materials and production techniques, impulse levels are much higher than in earlier models. Lightning arresters, too, have been improved over the years, so that today's transformer is better protected than those of the past.

Overload, another major cause of transformer failure, has come in for its share of attention. Winding techniques have been improved to provide better heat dissipation, and better blocking, bracing, and reinforcing provide higher short-circuit strengths. Even better overload protection is now available with improved fusing practices, secondary breakers, and a better understanding of the overload problem generally.

Can a dollar-and-cents value be assigned to higher impulse level, greater overload capacity, fewer lightning failures, and the like? Not too easily. A planned orderly replacement policy, however, would be much cheaper than the replacement of transformers as they burn out. Such burnouts result in emergency trouble calls, which are expensive, loss of revenue while the customer is out of service, and poorer customer relations. Information available would seem to justify assigning a life expectancy of 17 years to a transformer built before 1940, and of at least 30 years to today's.

What about retiring transformers brought into the shop for repairs, or those removed because of failure to satisfy load growth demands? Calculations indicate that retirement of transformers built before 1919 would be economically practical.

Calculations, based on the same formulas, show that the savings offered by a 1957 transformer in place of a

(*Continued on page* 100)

50-Kva Transformers, 2,400/4, 160Y-120/240 V, Single-Phase, 60 Cps

	1904–1919 New	1904–1919 Aged	1919–1940	1940–1956	1957
Core loss — watts	600	900	370	220	187
Core loss in percent of rating — %	1.2	1.8	0.74	0.44	0.374
Copper loss at rated load, at 75C copper temp. — watts	800	800	740	670	604
Exciting current in percent of the rated current — %	7	11	4.7	1.5	1.2
Total core and copper loss — kw	1.4	1.7	1.11	0.89	0.791
Magnetizing loss — kvar	3.45	5.41	2.31	0.72	0.57

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Operating Ungrounded Wye-Delta Banks

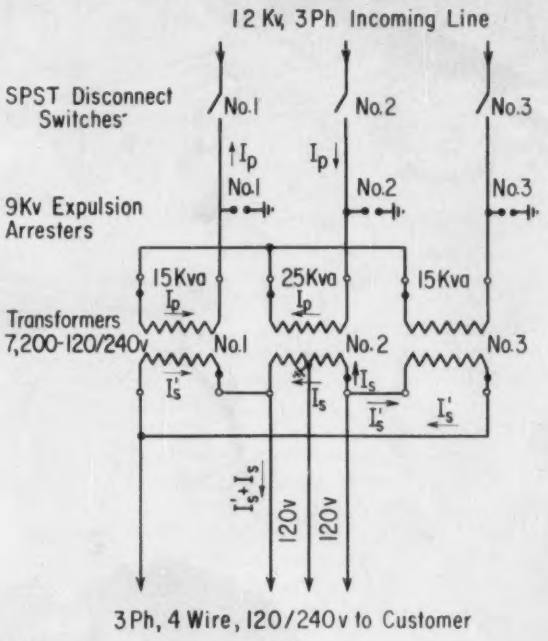
JERRY A. SELVAGGI, Distribution Engineer, Pennsylvania Electric Co, and Instructor, Gannon College, Erie, Pa.

Remedies are presented for avoiding over-voltage when re-energizing an ungrounded wye-delta bank of three single-phase transformers.

Given Condition: Referring to the diagram, all load removed from secondary side except the single-phase load on transformer No. 2; disconnect switch No. 1 closed. At closure of disconnect No. 2, expulsion arrester No. 3 sparked over, indicating high voltage. When disconnect No. 3 was closed, the lightning arrester valved off.

Lightning arresters normally spark over due to continuous voltage at 1.5 times their maximum line-to-ground rating, so the voltage across the arrester was at least 13,500 v.

The secondary single-phase load was dropped, and the same procedure of energizing the bank was repeated with normal voltages encountered.



Cause of Overvoltage. Loading transformer No. 2 resulted in current in its primary winding, so that the primary and secondary ampere-turns neutralized themselves, leaving the additional primary ampere-turns necessary to produce the required flux. Exciting current is normally a small percentage of full-load current. To return to the source, the primary current of transformer No. 2 had to go through the primary winding of transformer No. 1. Because I_p was greater than its exciting current and the secondary current of transformer No. 1 for all practical purposes was zero, all of NI_p of transformer No. 1 was used to create flux.

This flux, linking the secondary turns of transformer No. 1, created an above-normal secondary voltage. Because the transformers were tied together on the secondary side, this voltage was impressed across the load and the secondary of the transformer No. 3, resulting in current flow. With transformer No. 3 open on its primary side, all of its secondary ampere-turns created flux with no primary ampere-turns present to reduce the net flux. This flux, linking the primary winding, induced a high primary voltage which resulted in arrester spill-over. The greater the secondary load on transformer No. 2, the higher the primary voltage on transformer No. 3 with the practical limit occurring when the iron becomes saturated.

Precaution. Because a 12.47-kv circuit is normally worked either de-energized or with hot sticks, danger to personnel is remote. But a lightning arrester connected on the transformer tank can be destroyed under a sustained high voltage to cause a line-to-ground fault when the transformer is re-energized. A 4.16-kv circuit is normally worked with gloves and rubber blankets with normal line-to-ground voltage of 2,400v. Because this line-to-neutral voltage can rise to over twice normal to cause up to twice line-to-line voltage, definite precautions should be taken when personnel are close by.

Solution. This voltage condition can be remedied by one of the following procedures:

1. Dropping all secondary load eliminates for all practical purposes the secondary circulating current which is the primary cause of high sustained voltage. This procedure is recommended due to its simplicity, short outage time, and no additional expenditure of money in equipment.

2. Grounding the floating neutral results in the load current returning to the source without going through the primary winding of a second transformer. This minimizes exciting current in the secondary winding of the disconnected transformer. The main disadvantage of this arrangement is that the bank acts as a source of ground current on line-to-ground faults to operate two protective devices instead of one. If fuses are used, outage time would be extended.

3. Installing a gang-operated switch with simultaneous 3-phase operation eliminates this condition, but can not be justified due to its cost and the problem of mounting the switch.

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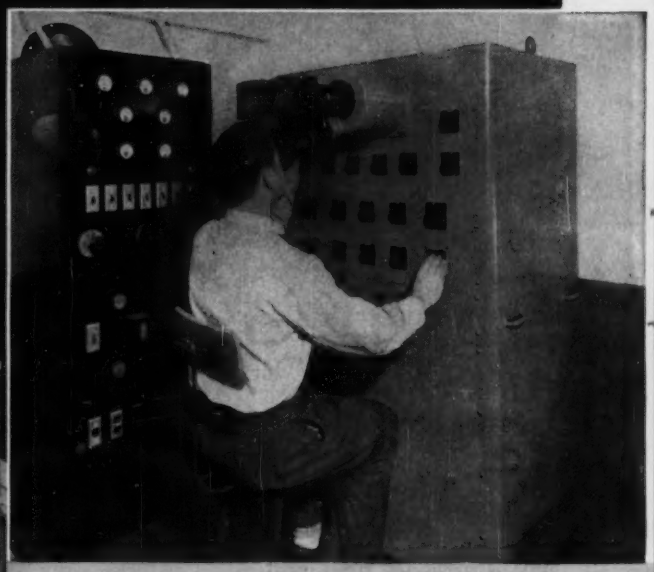

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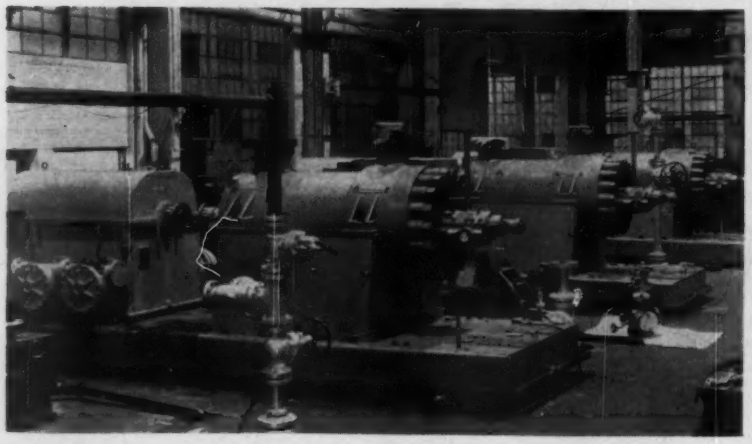
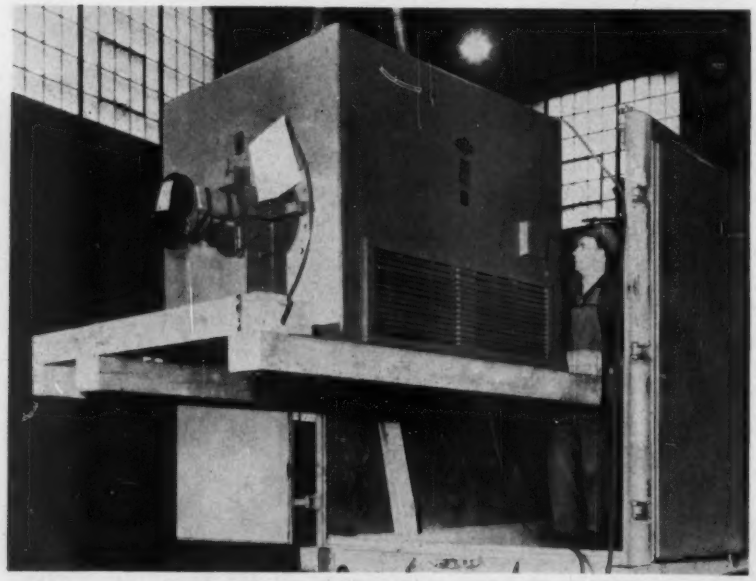


De Laval Prepares Boiler Feed Pumps

Three barrel-type boiler feed pumps, part of the auxiliary equipment for a new 305-mw turbine-generator at Commonwealth Edison Co's Fisk Station, Chicago, are shown being aligned at the Trenton, N. J. plant of De Laval Steam Turbine Co prior to shipment.

Each of the 8-stage, double-case, high-pressure pumps handles 1.3 million lb per hour of feed water at 2,280 psi and 343F. The pumps are driven, through variable speed hydraulic couplings, by 4,500-hp motors.



Wisconsin Coop Gets 'Straight-up' Motor

This straight-up, ventilated motor, rated 1250 hp, 3600 rpm, is designed for boiler feed pump service, (EW, Mar. 3, 1958, p 124). Made by the Electric Machinery Mfg Co, Minneapolis, Minn, it has been acoustically treated to hold operating noises to a minimum. It is shown here for shipment to Dairyland Power Coop's new power plant at Alma, Wisc.

Federal Pacific to Enter Protective Relay Field

Federal Pacific Electric Co, Newark, N. J. will enter the protective relay field. The new relays, to be manufactured in Newark under the terms of a license agreement with English Electric Co, Ltd., Stafford, England, are expected to be available for delivery within the next 3 months. With this step, Federal Pacific becomes the third American company engaged in the production of these switchgear control devices, used by electric utilities and industrial firms.

"The move not only fills a basic industry need," T. M. Cole, executive vice president, explained, "it is also part of a continuous program for expanding Federal Pacific's product coverage in the electrical field." He added that the new devices will supplement the instrument and relay lines of Roller-Smith Instruments Inc, recently established Federal Pacific subsidiary.

The new relays are the product of research by Dr. A. R. van Cortland Warrington, chief engineer of Meters and Relays, English Electric Co. The services of Dr. Warrington will be available to Federal Pacific as a consultant.

Westinghouse Looks Ahead With 'Cautious Optimism'

A big backlog of orders gives Westinghouse Electric Corp's Apparatus and General Products Div. a jump on 1958 sales. Board Chairman Gwilym A. Price told stockholders recently that unfilled orders which could be billed in 1958 amounted to about half of Westinghouse's expected sales.

Price made no dollar predictions for 1958 sales and earnings. He said he did not expect first quarter results to be up to 1957, but stressed that those results would not be indicative of the rest of the year.

He summarized his opinion of the business outlook as one of "cautious optimism, with the expectation that business will pick up in the fourth quarter."

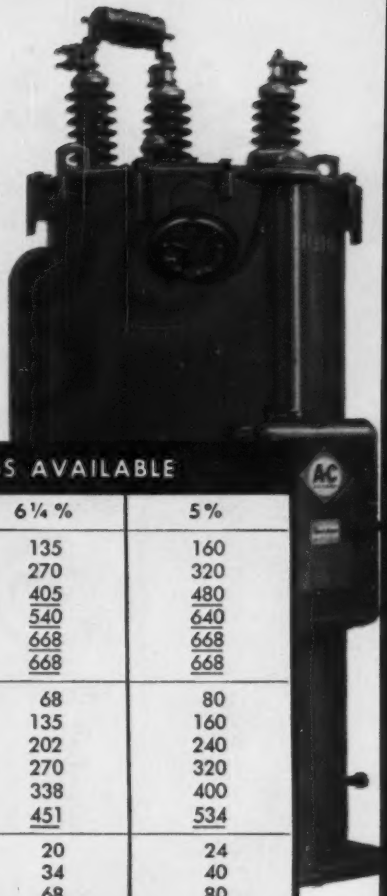
(*Continued on page* 80)

Allis-Chalmers—25 Years of Leadership in 5/8% Regulators

now... *Vari-Amp Ratings*

to 668 Amperes on Allis-Chalmers

distribution voltage regulators



RATING		RANGE AND CURRENT RATINGS AVAILABLE				
VOLTS	KVA	10%	8¾%	7½%	6¼%	5%
2,500	25.0	100	110	120	135	160
	50.0	200	220	240	270	320
	75.0	300	330	360	405	480
	100	400	440	480	540	640
	125	500	550	600	668	668
	167	668	668	668	668	668
5,000	25.0	50	55	60	68	80
	50.0	100	110	120	135	160
	75.0	150	165	180	202	240
	100	200	220	240	270	320
	125	250	275	300	338	400
	167	334	367	401	451	534
7,620	11.4	15	17	18	20	24
	19	25	28	30	34	40
	38.1	50	55	60	68	80
	57.2	75	83	90	102	120
	76.2	100	110	120	135	160
	114.3	150	165	180	203	240
	167	219/241	241/265	263/289	296/326	351/386
	250	328/361	361/397	394/434	443/487	525/578
13,800	34.5	25	28	30	34	40
	69.0	50	55	60	68	80
	138.0	100	110	120	135	160
14,400	36.0	25	28	30	34	40
	72.0	50	55	60	68	80
	144.0	100	110	120	135	160

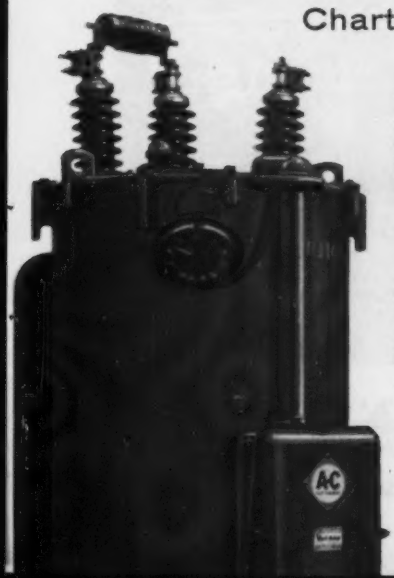


Chart shows ratings to 668 amperes with 21 new *Vari-Amp* ratings

Vari-Amp can now be used to increase regulator capacity (while decreasing range of regulation) to a maximum allowable current of 668 amperes or 160%. This new development results in increased applications for distribution regulators and further lowers the cost of regulation.

You now get as much as 50% increased kva capacity on 21 different ratings of Allis-Chalmers ⅝% step regulators.

These new load-carrying capabilities have been tested in actual field service for four years and many of the new ratings are in stock for immediate shipment. Behind this announcement is the continuous development program that has maintained Allis-Chalmers design and operational leadership during the past 25 years.

For details, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5731

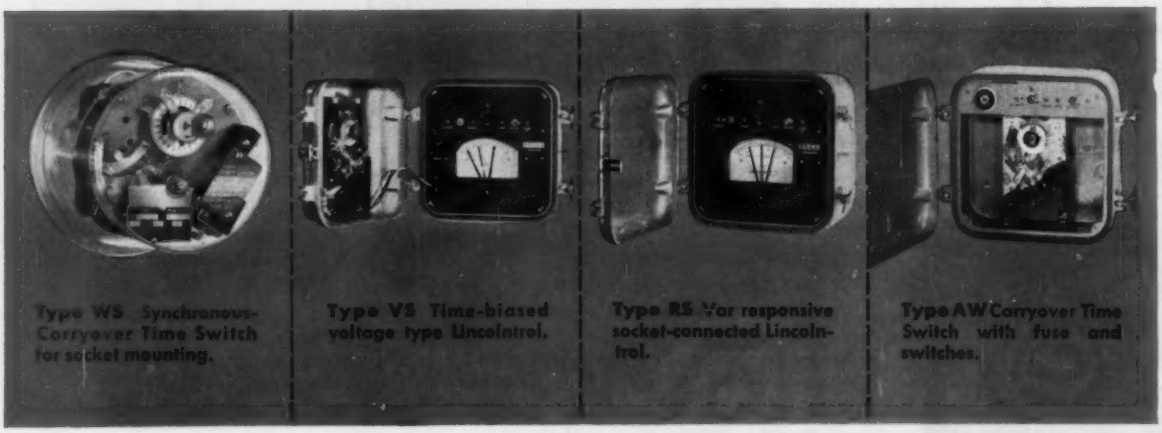
SANGAMO AUTOVAR CAPACITOR EQUIPMENTS

...low in cost...light in weight ...quick and easy to install

Sangamo pole-type Power Capacitor Equipments are completely assembled—wired at the factory—ready for automatic operation. They enable fast, easy capacitor installation on distribution circuits in amounts approximating peak load kilovars.

Available in multi-row design for crossarm mounting and in-line design for direct pole mounting, in all distribution voltage ratings and with standard Kvar ratings from 225 to 600 kvar. Equipments include mounting rack, capacitor units, electrically operated oil switches (optional), junction box and all wiring.

The industry's most complete, versatile and economical control equipment...



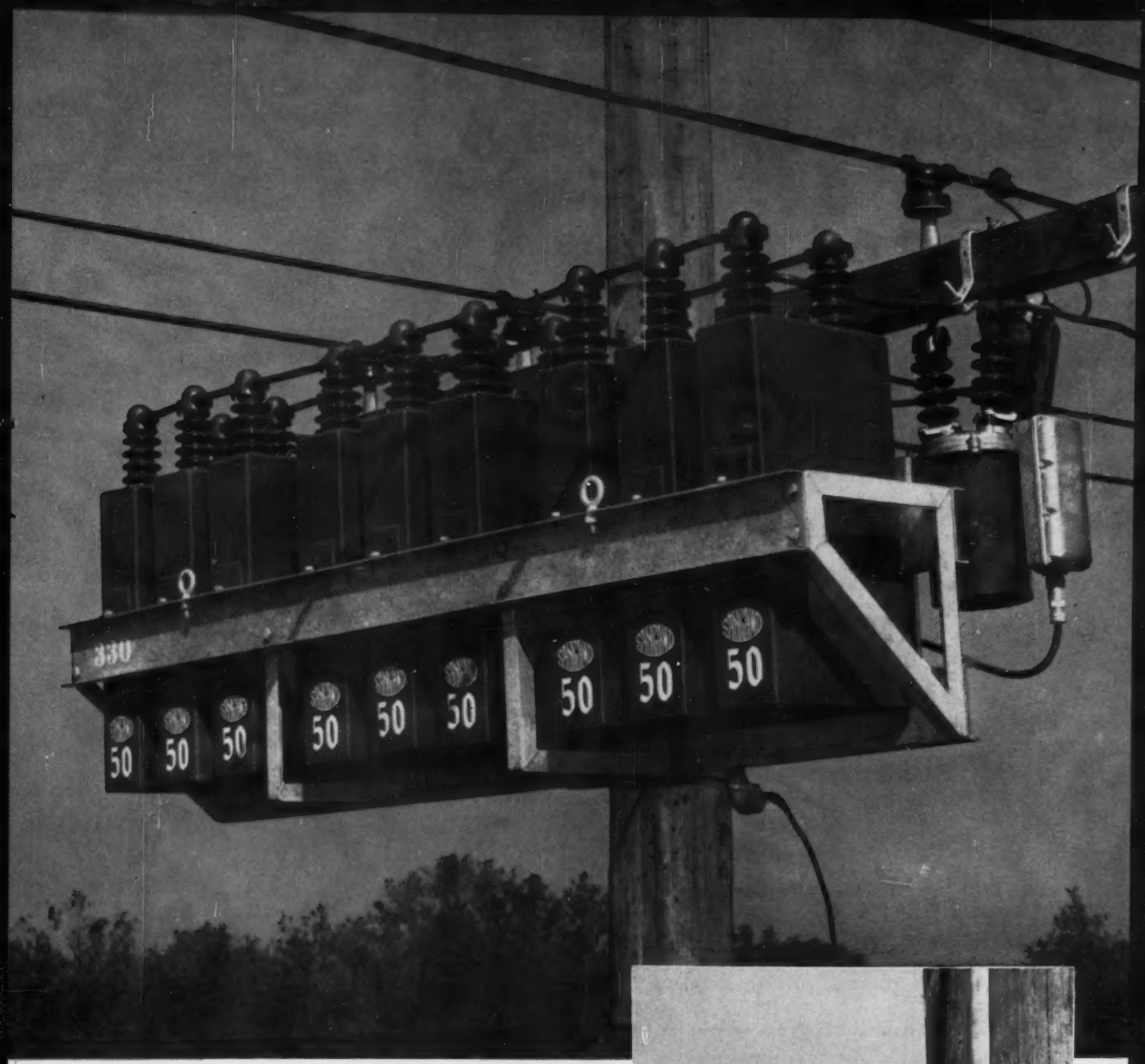
Type WS Synchronous-Carryover Time Switch for socket mounting.

Type VS Time-biased voltage type Lincolntrol.

Type RS Var responsive socket-connected Lincolntrol.

Type AW Carryover Time Switch with fuse and switches.

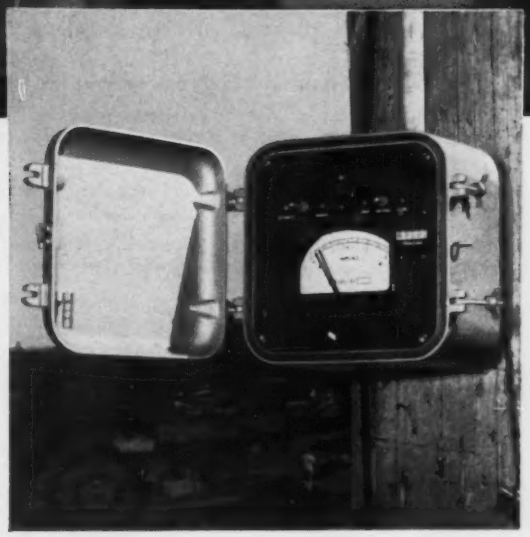
Whether you control capacitor switching as a function of time, volts, amperes, watts, or vars—or as combinations of these functions—there's a Sangamo control best suited for your purpose.



A typical pole-mounted 450 kvar in-line switched capacitor equipment, with 50 kvar, 2400 volt Sangamo Capacitors.

The capacitor switching is controlled by the Type AS current responsive Lincolntrol shown at right.

Look to Sangamo for all your capacitor requirements. Ask your Sangamo Representative, or write us for Bulletin 1110.



LIVE BETTER ELECTRICALLY

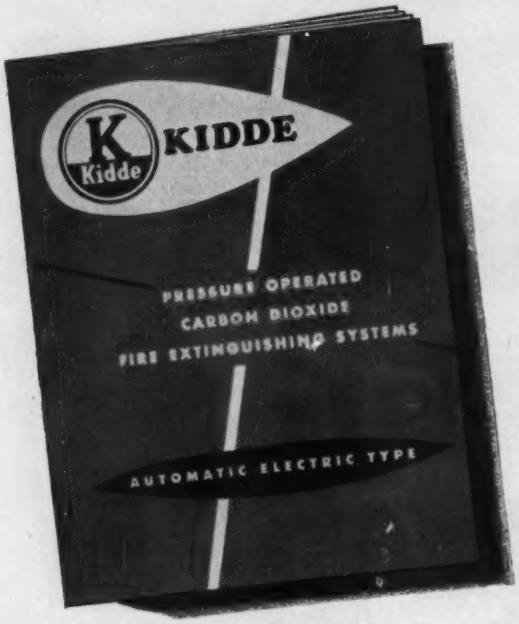
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

PC58-3

GET THIS FREE

INFORMATION-PACKED BOOKLET!



LEARN THE FACTS ABOUT AUTOMATIC FIRE PROTECTION!

Ideal fire protection for any electrical hazard, Kidde Automatic Carbon Dioxide Fire Extinguishing Systems kill fire quickly, cleanly, will not harm intricate equipment, leave no mess after a blaze, will stand guard 24 hours a day!

You get all this information . . . and more!

Automatic Electric Systems — What they are, how they operate, why they are best for your needs!

Electric Control Heads — A Kidde development that simplifies operation and inspection of the system!

Directional Valve Systems — The method by which you can get multiple protection from one bank of cylinders!

Pressure Operated Trips and Switches — How they can close doors, windows, dampers, shut off machines, fans and other electrical equipment and isolate the fire area!

Discharge Delay Circuits — An extra margin of safety for the protection of occupied work areas!

System Testing — An outline of how you can completely test Kidde systems quickly and easily on a no-parts replacement basis!

Get your own copy of this informative Kidde booklet! Write to Kidde or send the coupon today!

WALTER KIDDE & COMPANY, INC.
430 MAIN STREET, BELLEVILLE 9, N. J.

Please send me your Automatic Fire Extinguishing Systems Booklet and full information on Kidde systems.

NAME_____

ADDRESS_____

CITY_____ STATE_____

Westinghouse Looks Ahead

(*Continued from page* 76)

Westinghouse is fighting the "profit squeeze," which last year cut its net $7 million below the 1954 level at the same time that billings topped 1954's record total by 23%.

Price told of a new inventory control system that has improved the company's cash position. He said cost cutting efforts were continuing, and promotion being stepped up.

GE Transistorizes Carrier Current and Radio Units

Newly designed carrier current equipment as well as two-way portable VHF radios will soon be available with transistors from General Electric Co.

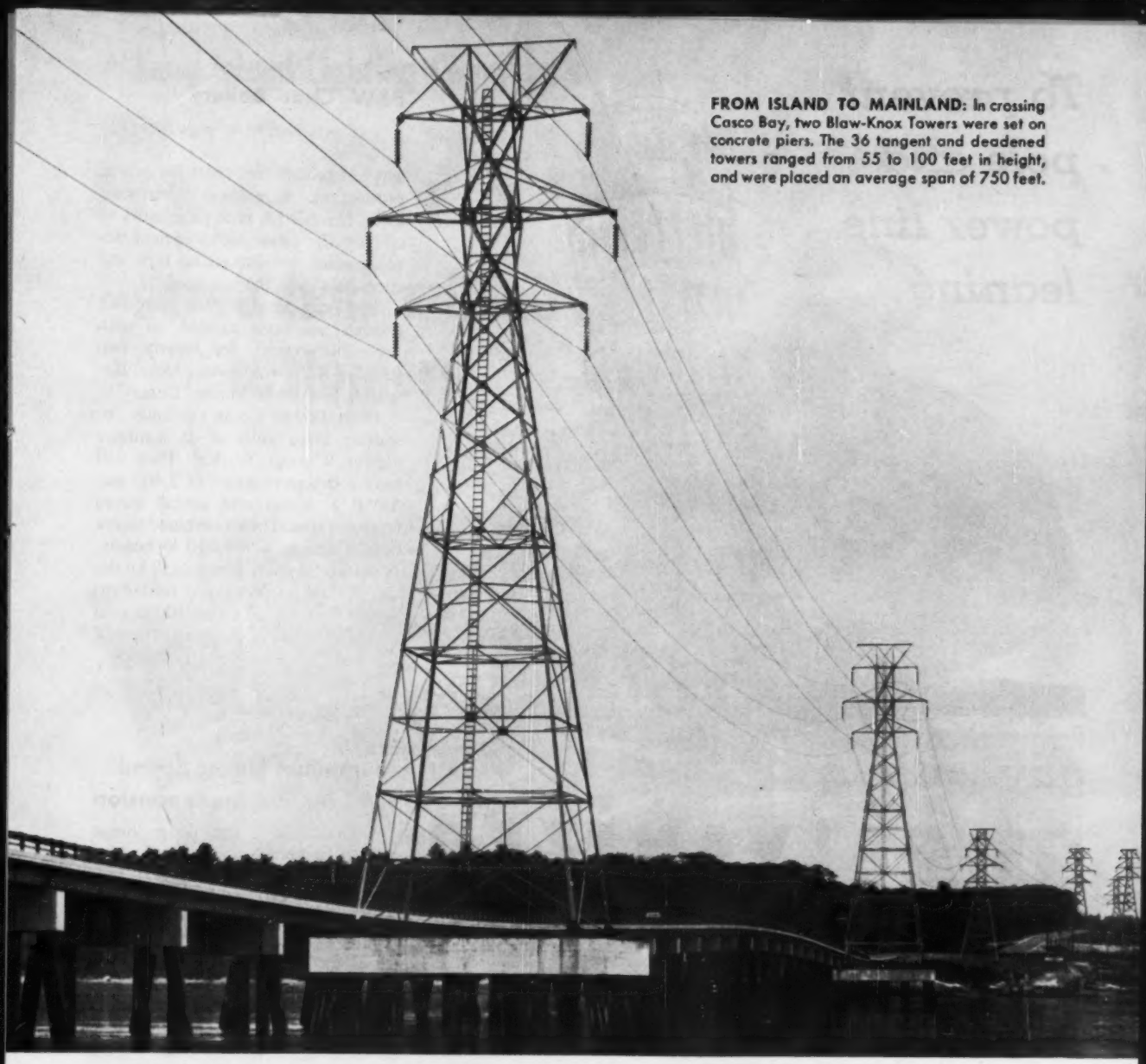
On transistorized carrier current equipment, plans are nearing completion to market additions to the company's line. The equipment—transmitters and receivers—is designed for various functions. The line reportedly features better reliability and performance, low maintenance, and requires approximately the same space as the company's previous equipment.

Hand-carried two-way radio with transistorized receiver is now in quantity production. The 25-54 mc low-band units, employing transistors for 100 mc, will be the first to come off the production line. They will be followed by 144-174 mc high-band units with transistors engineered for use up to 200 mc. The transmitter-receiver equipment features lightweight, compactness and sensitivity which is important in remote areas. For use indoors and outdoors, these units will have their greatest usage in places inaccessible to radio-equipped vehicles.

B&W 'Char' Boilers Operated by Ohio Power

Boilers capable of burning a new type of low-volatile "char" have been developed by The Babcock & Wilcox Co, New York. The development is described by a company spokesman as a "major breakthrough in the continuing search for

(*More Manufacturers News, page* 82)



FROM ISLAND TO MAINLAND: In crossing Casco Bay, two Blaw-Knox Towers were set on concrete piers. The 36 tangent and deadened towers ranged from 55 to 100 feet in height, and were placed an average span of 750 feet.

Central Maine chooses Blaw-Knox Towers to carry lines from new Cousins Island Plant

The new Yarmouth Steam Plant—the newest and potentially the largest in Maine—is the latest development by Central Maine Power Company to meet the increased needs of its growing number of customers. The new showcase plant will use two 44,000 kw turbine-generators along with the latest and largest transformers and condensers in the state.

To carry the 115,000 volt lines from Cousins Island to the Moshers substation in Gorham, Blaw-Knox designed and fabricated 36 steel transmission towers. Working with Central Maine's engineers Blaw-Knox was able to bring over 40 years of transmission tower experience to the job. Basic concepts evolved from this extensive experience are used to build towers that are superior in strength, simpler to erect, easier to modify.

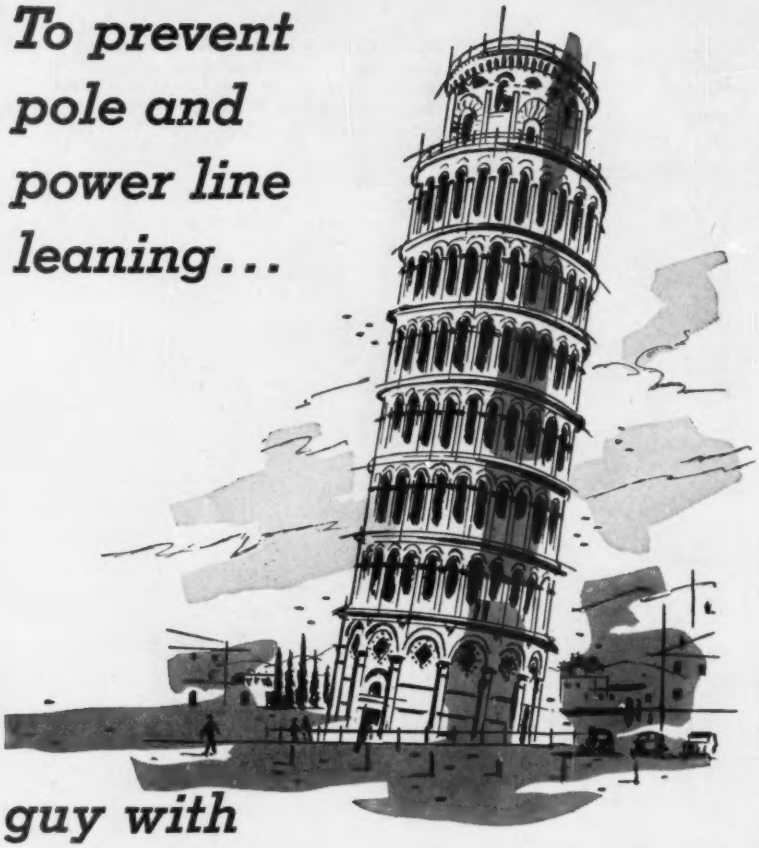
See how this background can pay off in meeting your own tower requirements. For details, send for Folder 2509 and tell us your needs. We'll gladly give you our recommendations and a quotation.

Transmission Towers—Steel Transmission towers, custom-built for each installation . . . multi-circuit and other special structures . . . and antenna towers, guyed and self-supporting types for AM • FM • microwave • communications • radar • parabolic antennas

BLAW-KNOX

BLAW-KNOX COMPANY
Equipment Division
Pittsburgh 38, Pennsylvania

To prevent pole and power line leaning...



guy with

CF&I GALVANIZED STEEL STRAND

Whether it is an installation involving exposure to the corrosive action of acrid industrial fumes or to severe storms—public utility linemen know that CF&I Galvanized Steel Strand will withstand rugged service.

Meticulous adherence to standards characterizes every step in the manufacture of CF&I Galvanized Steel Strand. It meets or exceeds ASTM Specifications A-122 or A-363—or, if you prefer, our Buffalo, N. Y. or Pueblo, Colo. plants will make it to your specifications in seven- or three-wire constructions. When you're in the market for top quality, guy, messenger or overhead ground wire, contact your nearby CF&I representative or your local electrical distributor.

5690

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Chicago • Denver Detroit • El Paso • Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Los Angeles • New Orleans New York • Oakland • Oklahoma City • Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • Seattle • Spokane • Wichita. CF&I OFFICES IN CANADA: Montreal • Toronto

B&W 'Char' Boilers

(*Continued from page* 80)

ways to reduce fuel costs for power production. It makes it economically feasible for coal processors to employ the latest technological developments for extracting tars and chemicals from the raw coal."

Test burning of the fine coke-like residue has been carried on with favorable results for nearly two years at B&W's Alliance, Ohio, Research and Development Center.

Ohio Power Co is currently installing three units at its Kammer Station, Cresap, W. Va. They will have a design pressure of 2,400 psi, 1,050 F steam and reheat steam temperatures. Their combined steam output will be 4,569,000 lb hourly. A feature of these boilers will be the use of dual proportioning feeders to permit the firing of either 100% coal or 100% char, or any proportion of the two.

Aluminium Ltd. to Spend $100 Million for Expansion

Confident of the long range growth of aluminum demand, Aluminium Limited (Canada) will spend about $100 million in 1958 to expand its ore and hydroelectric facilities. Nathanael V. Davis, president, said there have been some signs in recent months that consumption of primary aluminum has stabilized. But he noted that in some markets this is at a level appreciably below the normal trend line.

"A return to more normal growth rates will be required to bring supply and demand into balance," he said. "We do not doubt that this will happen and that the turnabout could come suddenly . . ."

Mr. Davis reported that, although the current excess of supply has idled 150 tons of the company's primary ingot capacity and temporarily halted smelter construction, the company is proceeding with the build-up of its hydroelectric capacity in Quebec Province and raw material sources in Jamaica, British Guiana and French West Africa.

(*More Manufacturers News, page* 84)

Long Island Lighting Company's

Noise-Proof Lines

serve half million customers

EXCLUSIVE FEATURES

Type "N" Insulators... with Conducting Glaze

1. Noise-free characteristics guaranteed.
2. *Separate* conducting glaze gives uniform surface conductivity—surface not diluted with standard brown glaze.
3. Smooth surface—no abrasion to conductor.
4. Impervious to elements—a conducting ceramic glaze.
5. Ready identification—distinctive difference in color between black "N" glaze and regular brown glaze.

An increase of 98% in new customers over a five year period—home building in boom proportions—were only a few of the tremendous growth problems faced by Long Island Lighting Company serving an area of 1230 square miles.

Television and radio interference problems also become more acute in proportion to growth. Distribution engineers, as well as the Public Relations Department must be alert for methods of quieting old lines, as well as designing quietness into new lines.

Long Island Lighting Company is one of the many utilities throughout the country using Type "N" Pintype Insulators on their lines. Type "N" construction *eliminates* radio and TV interference developing at the insulator. You, too, can be *assured* of noise-free lines and of better-satisfied customers when you specify Porcelain Products' Type "N" Insulators.

PP INC.

LIVE BETTER ELECTRICALLY

Porcelain Products, Inc.

High Voltage Division — **Parkersburg, W. Va.**

It's NEW!

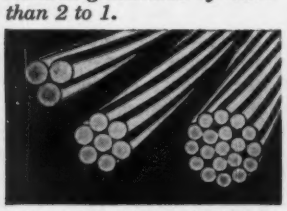
Wire that combines the strength of steel with the high corrosion resistance of aluminum

It's ACCO *Aluminized!*

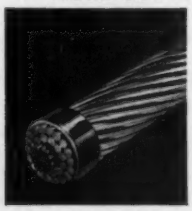
PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U. S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*



Also... PAGE *Aluminized* ACSR CORE WIRE



Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

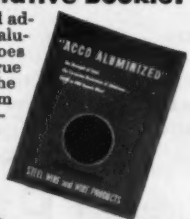
ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for **Booklet DH537-A.**



ACCO for Better Values

Page Steel and Wire Division

AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO

Assembly for Dura-Crimps

A revolutionary designed machine for assembling "Dura-Crimp" compression sleeves has been developed at Anderson Electric Corp, Birmingham, Ala. It has a maximum production of 10,000 units per shift, and handles a maximum number of steps in assembling the high conductivity Dura-Crimps. These steps include: Marking part numbers and cable ranges; applying inhibitor; sealing each sleeve with colored plastic for identification purposes; and packaging and counting contents of each package. (Two machines now in operation produce 300,000 sleeves every 5 days.)

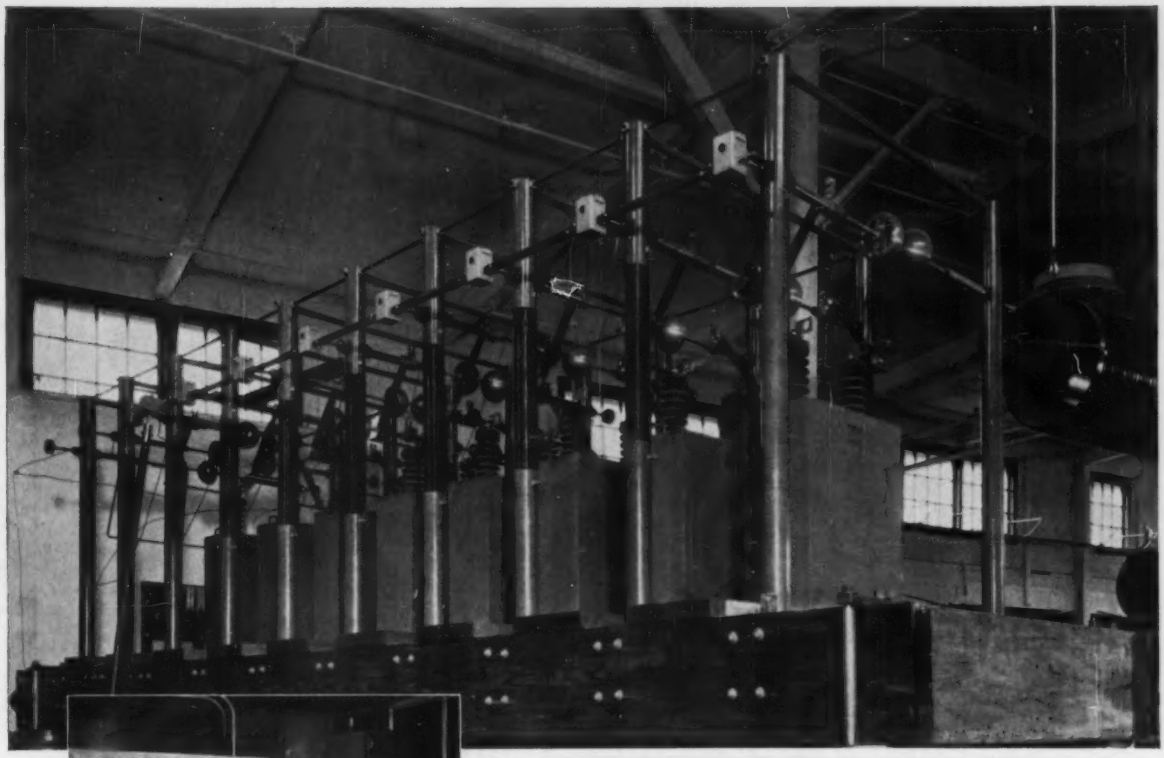
MANUFACTURERS BRIEFS

Lotran, Inc, is the new name for Motrel, Inc, Baton Rouge, La. The change was made because of similarity of existing names. The company makes an automatic outage locator which transmits a coded signal via space radio on the power company's existing mobile frequency in response to the tripping of an associated sectionalizing device.

Allis-Chalmers Mfg Co, Milwaukee, Wisc., has developed a complete line of three-phase feeder voltage regulators. They are rated 500 and 750 kva, 8660 v, and 500, 750 and 1000 kva, 13,200 v. Added features are reductions in weight, installation space and cost.

Porcelain Products, Inc, Carey, Ohio, held a two-day open house recently for 400 guests. The occasion was to celebrate the formal opening and public presentation of new office facilities at the company plant.

Koppers Co, Inc, Baltimore, Md., has a design change which eliminates lubrication service on pistons in electrostatic precipitators. The secret lies in providing the wearing surface of the rapping mechanism pistons with a layer of a special compound, "K-30," composed of Teflon and other wear-resistant materials. The rate of wear on pistons and cylinders is also reportedly reduced.



The technician at the control panel of Victor's impulse generator shown above, is photographing steep front wave forms for detailed laboratory study.

Steep Front Wave Tests at *VICTOR* Help Make Better Insulators

By David E. Alexander, Chief Engineer
Victor Insulators Division, I-T-E Circuit Breaker Co.

"The high voltage impulse generator in the Victor electrical laboratory enables us to simulate the most severe conditions of service an insulator will ever experience in use. By photographing the various wave forms caused by high voltage discharges, we are able to study in detail and at length, their many characteristics and their effects on insulator design and construction.

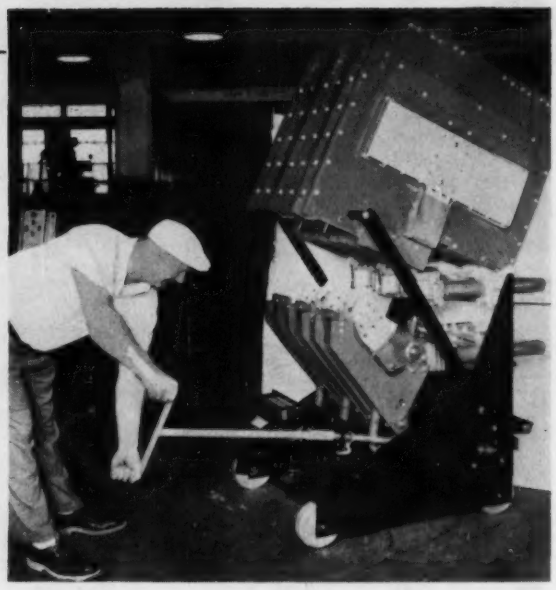
For some time now, we have been delving into the little known realm of steep front wave forms. This research has already resulted in better, stronger high voltage insulators . . . points the way to even better insulators as our studies continue."

This is but one phase of Victor's broad continuous program of research in electricity, ceramics and manufacturing methods . . . a program that bolsters our contention that "you can't buy better insulators at any price!"

I-T-E CIRCUIT BREAKER COMPANY
VICTOR INSULATORS DIVISION
Victor, New York

New Equipment

1,000 MVA Air Breaker . . .

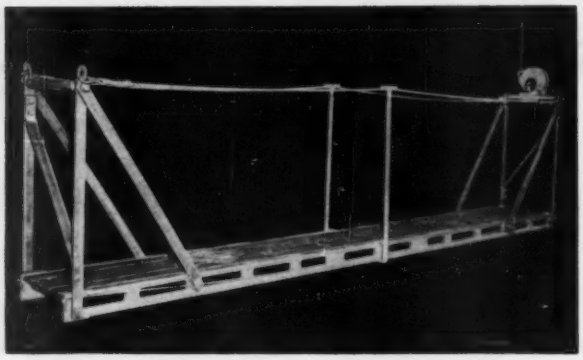


. . . has 35% greater interrupting capacity than next lower rating of its type, with only 4-inch increase in depth and same height and width. Designated 150-DH-1000, this 13.8-kv metal clad breaker is designed primarily for protecting distribution circuits in large metropolitan substations.

Horizontal drawout simplifies maintenance and replacement. Ceramic arc chutes have high dielectric strength, low moisture absorption, and high resistance by heat shock.

Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.

Light-Weight Scaffold . . .

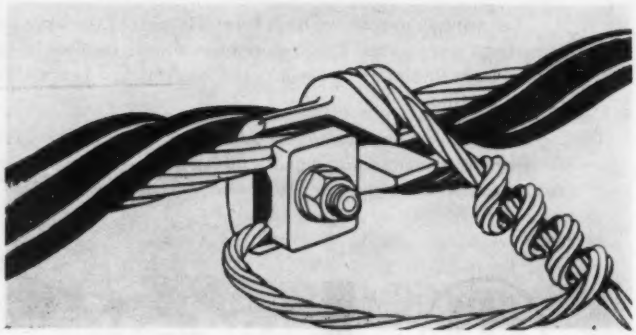


. . . is used on towers for work on transmission lines. Platform makes it easier to change out disc insulators on strain strings for cold line maintenance. It may also be used for construction work and armoring sagging conductors.

Available in lengths from 12 to 25 ft, it is made principally of aluminum alloy. One end of platform is attached to arm by chains or tie lines; outer end is swung into position from superstructure above by line.

Bodendieck Tool Co, Rt 48 North, Taylorville, Ill.

Neutral Connector . . .



. . . for use with triplex secondaries and service drops combines mechanical and electrical connections in single unit. It is easily installed, without special tools or knowledge. Unit may be used singly or in groups of two or more for any number of service drops in any direction. Designated Type ACN, it is cast of high strength, high conductivity aluminum-silicon alloy. Standard hardware is heat treated galvanized steel. Connector grooves are designed to prevent conductor damage. Unit may also be used with common dead end with a bail.

Dossert Mfg Corp, 249 Huron St, Brooklyn, N. Y.

(*More New Equipment on page* 91)

INSULDUR

a major breakthrough in insulation for all Westinghouse pole-type distribution transformers

Only the Insuldur system gives your distribution transformers the ability to live longer. This patented process makes practical further increases in distribution loads without endangering normal service life or permits longer life with present loading.

YOU CAN BE SURE... IF IT'S

Westinghouse

here is what the

INSULDUR®

system is:

A product of Westinghouse research that will protect major . . . layer . . . and turn-to-turn insulation in pole-type distribution transformers. The basic components that make this possible are:

- Inhibited oil
- New high-temperature enameled wire
- Insuldur insulation

These three basic factors comprise the Insuldur system—available only in Westinghouse distribution transformers.

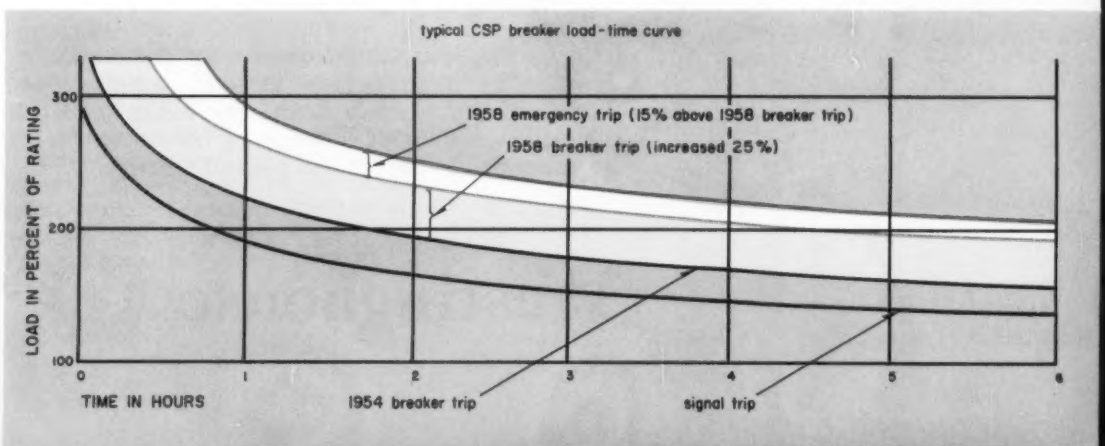
here is what the

INSULDUR

system does:

It allows the operating temperature to be raised 25% above the 1954 Westinghouse distribution transformer—without sacrifice of normal service life. This means that you can . . .

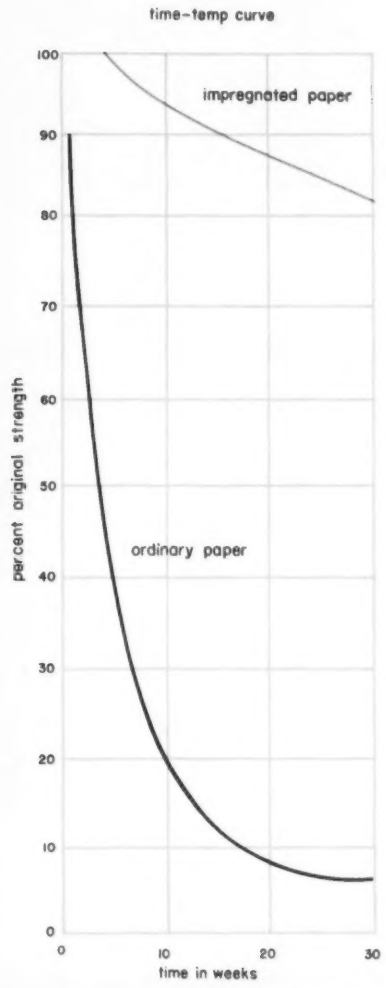
- load transformers heavier with the same life expectancy
- or increase life expectancy while maintaining present loading practice



and here is proof:

INSULDUR "stays alive"

when other insulations char, crumble and "die"



Aging-rate curves of ordinary paper and the Insuldur paper. The extra resistance to aging shown in these results proves the Insuldur system 10 times stronger.

Visual inspection shows that insulation from an ordinary transformer has darkened and tended to carbonize from the effects of service aging. The insulation from an Insuldur-protected transformer shows little change due to the combination of heat, moisture, oil and mechanical stress.

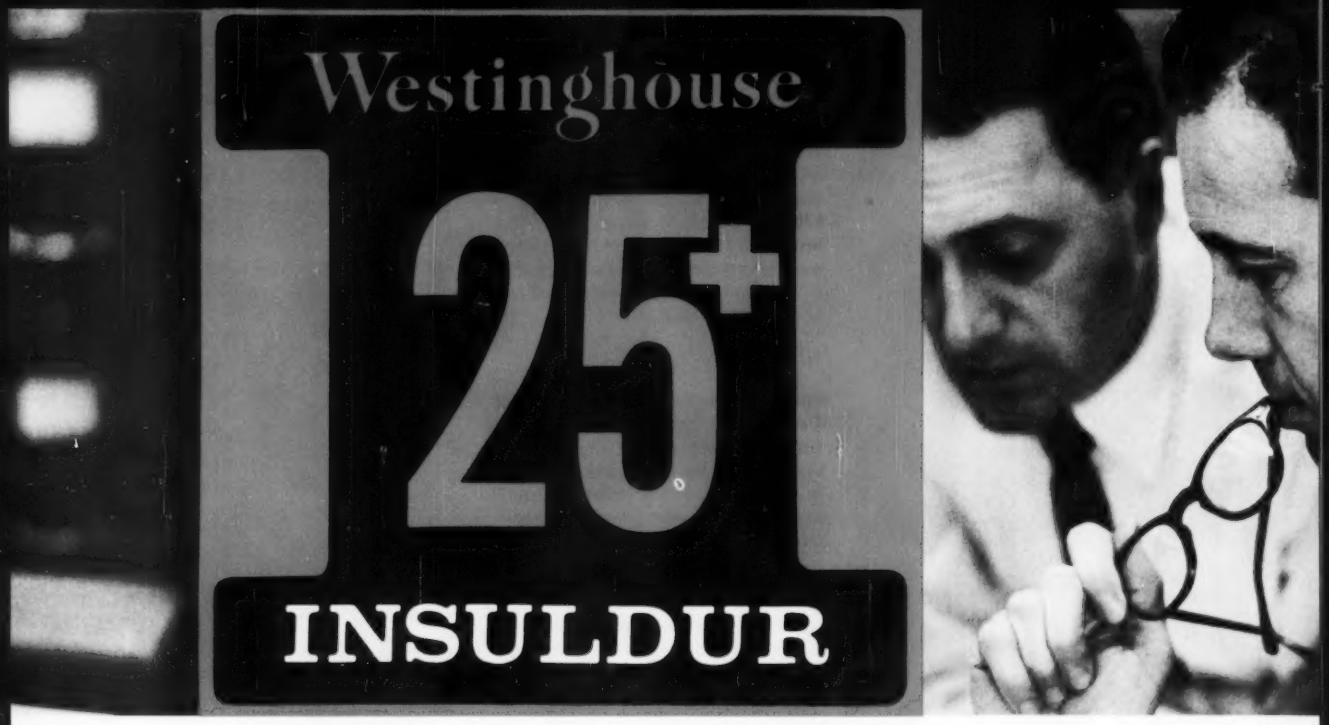
The "Crumble Test" offers proof that transformers not protected by the Insuldur system are in danger of having their service life shortened. Here is proof, too, of the extra life built into every Insuldur-protected transformer.

Here the ordinary insulation has "died," while Insuldur insulation has sprung back, full of life. This means that under conditions such as short circuits in actual transformer service, ordinary insulation—and the transformer itself—could "die" . . . but the Insuldur-protected transformer would continue to live.

TRY IT! Perform the "Crumble Test" yourself . . . compare the resistance to service aging exhibited by Insuldur insulation with the breakdown of ordinary insulation. Call your Westinghouse representative . . . he will be glad to supply you with samples of both, so that you can prove for yourself the amazing durability of Insuldur insulation.

INSULDUR*

protected transformers are identified by the big "I"



*another improvement in distribution transformers created by PLOWBACK of earnings into research

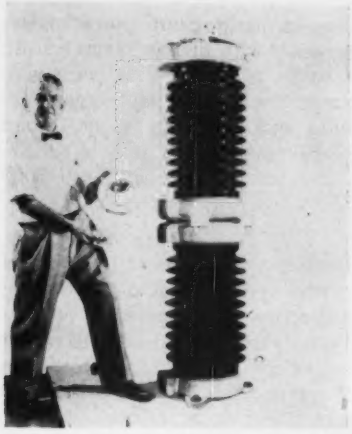
Again, in the creation of Insuldur, Westinghouse leadership in distribution transformer development is maintained by plowing back earnings into research—pure and applied . . . into design and development engineering . . . into test facilities. That's why Westinghouse distribution transformers bring you tomorrow's performance—today!

J-70843-R-4

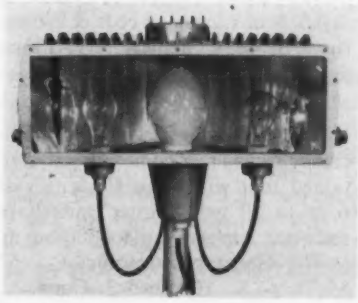
YOU CAN BE SURE...IF IT'S Westinghouse

Station Type Arresters . . .

. . . are approximately 40% shorter than predecessors. Long duration discharge capacity has been raised 54%, from 650 to 1,000 amp for 2,000 microsec. rectangular wave, 20 shots. Designated Form 3K, the new line includes ratings from 60 to 267 kv. High current and duty cycle test capabilities are same as Form H arresters.



Basic units rated 42, 48, and 60 kv can be added or removed to change total rating of stack. In the redesign, magnetic coils were eliminated and disc-shaped Thyrite valve elements were replaced by ring-shaped elements with greater cross sectional area and volume.
General Electric Co, Schenectady 5, N. Y.



Protective Lighting . . .

. . . combines mercury vapor and incandescent lamps to assure constant illumination at below zero temperatures. Two long-life incandescents provide instantaneous lighting and heat up interior of sealed weatherproof fixture, to bring more powerful and efficient mercury vapor lamp into action. Mercury lamp will strike and operate at outside temperatures as low as —65 F.
Wide-Lite Corp, P. O. Box 191, 4114 Gulf Freeway, Houston, Texas.

Vertical P-Base Motors . . .

. . . in sizes from one to 40 hp are available in protected, totally-enclosed, fan-cooled, and explosion-proof enclosures. Designed for direct mounting on high thrust pumps, they are offered in all standard speeds up to 3,600 rpm. In units of 20 hp and above, upper thrust bearing is oil-lubricated for cooler continuous operation under extreme thrust loads.
Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio

Vulcanizing Press . . .

. . . for reinsulating and rejacketing cables with natural rubber, synthetic rubber, or thermoplastic coverings accommodates all standard cable sizes through use of interchangeable molds. Rated at 3 kw, these presses are available for operation on seven standard a-c and d-c voltages. Press may be used for Y and T splices. Molding pressures up to 25 tons are produced.
Joy Mfg Co, Electrical Products Div, 1201 Macklind Ave, St. Louis 10, Mo.

Induction Heaters . . .

. . . are offered in three frequency ranges: one to 10 kc, 7.5 to 1,750 kw, powered by motor generator; 450 kc, 3 to 50 kw, electronic generator equipped; and 27.1 Mc, 0.75 to 20 kw, with electronic generator. Installations can be furnished with automated handling and feeding systems. Units offer precision control for heat treating, pre-heating, ingot breakdown, brazing or soldering.
Robotron Corp, 21300 W Eight Mile Rd, Detroit 19, Mich.

(*More New Products on page* 92)

LABORATORY CONTROLLED . . .

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

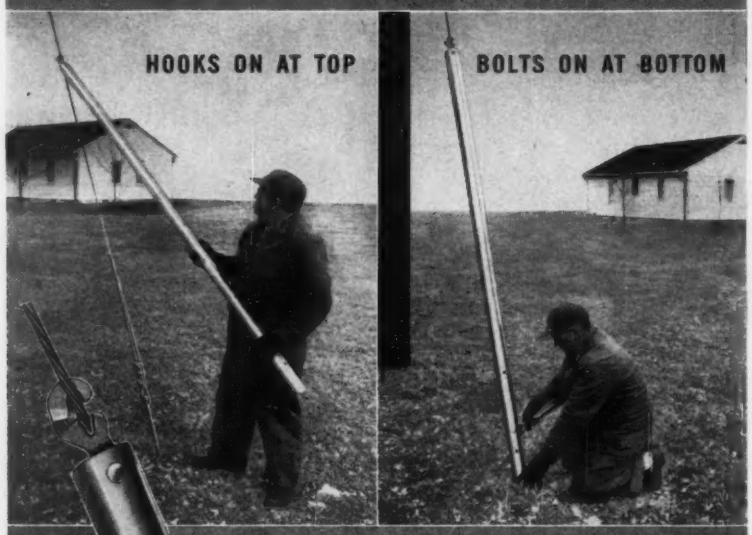
Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Question: What makes the CHANCE 808 GUY GUARD the groundman's preference?



Answer: Ease of Installation!

Guy Guards that are easy to install are easy to get installed where and how you want them. The Chance 808 is an inexpensive guy guard designed for fast, easy installation. Even a midget can install it—there are no high bolts to fasten at the top—only one bolt at the bottom.

The 808 hooks easily around the guy wire at the top. The hook binds to hold tight when bottom of guard is brought into position. Hook holds guard away from wire to eliminate noisy vibration. Flanged edges of hook prevent strand cutting, and help to keep guard in position.

Single bolt at lower end of guard fastens to guy rod . . . or to guy wire . . . or to guy loop. You get proper installation every time.

Economical too!

The Chance 808 is economical in first cost . . . in labor costs . . . and in service. It is made of heavy gauge steel, hot dip galvanized for long life and high visibility. Edges are turned in for extra safety and rigidity.

Get the Chance 808 from your Line Equipment Wholesaler. Your groundmen will like its features . . . and you'll like the savings.

A·B·CHANCE CO·
CENTRALIA, MISSOURI
(A. B. Chance Co. of Canada, Ltd., Toronto)

CP58-4

MORE NEW PRODUCTS

Self-protected selenium **battery charger** for heavy-duty applications is available in sizes from 5 amp to 1,000 amp for batteries from 6 to 230 v. Output of the Selenicharger can be shorted indefinitely without damaging the charger.—American Rectifier Corp, 95 Lafayette St, New York 13, N. Y.

Five-in. **strip chart potentiometer recorder** with plug-in range resistor features is available in variety of ranges for thermocouple, resistance bulb and linear mv spans. Chart speeds range from one in./hr. to 2 in./sec.—Westronics Inc, 3605 McCart St, Ft. Worth, Texas.

Heating transformer for molybdenum furnaces has a 10,000-amp secondary with maximum of 5 v. Primary taps are extended to reduce secondary to 0.75 v.—Nothelfer Winding Laboratories, Inc, Box 445, Trenton, N. J.

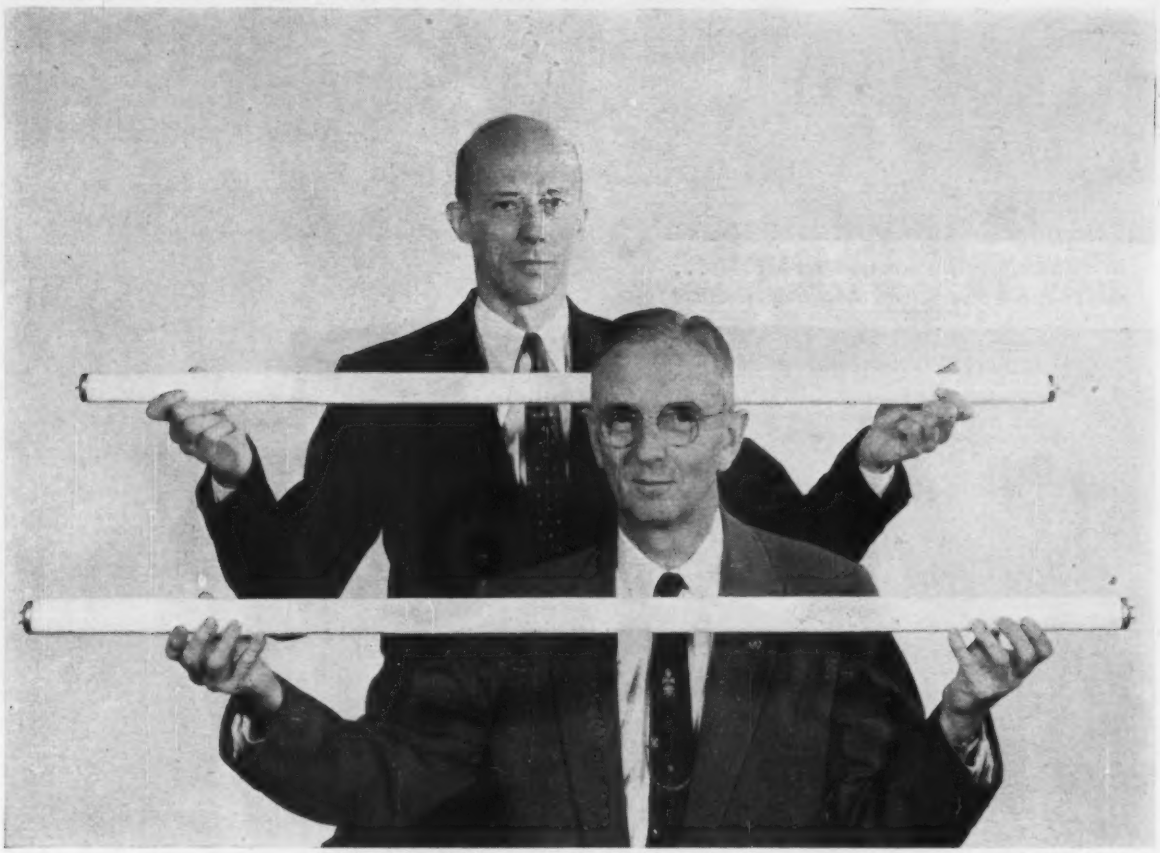
Transformer-rectifier, Model 9886 Current Converter, provides a d-c output proportional to an a-c input. Available in three types for 60-cps use in current circuits up to 5 amp. —Weston Instruments Div, Daystrom, Inc, Newark 12, N. J.

Current-adjusting **electric furnace control** system for use with magnetic amplifiers and saturable core reactors continuously regulates power input. Limit of error is ±0.5% of range.—Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

Ultrasonic cleaner with high efficiency transducer comes as self-contained unit with tank capacities of 6 qt to 50 gal. Larger units have radiating surfaces up to 300 sq in. —The General Ultrasonics Co, 67 Mulberry St, Hartford 3, Conn.

Series C **plugs and receptacles** for interrupting circuits in ratings of 30, 60, 100 and 200-amp, 600 v, ac are designed to meet severe industrial environmental conditions.—Pyle-National Co, 1334 N. Kostner Ave, Chicago 51, Ill.

GENERAL ELECTRIC'S 20th FLUORESCENT ANNIVERSARY ANNOUNCEMENT:



R. N. THAYER (left) AND G. E. INMAN developed first commercial fluorescent lamp in the U.S.A. in 1938. Still with General Electric, they have been key men in many G-E fluorescent lamp improvements.

Today's G-E Fluorescent Lamps give your customers 76% more light per watt, last 5 times longer...yet cost ½ as much!

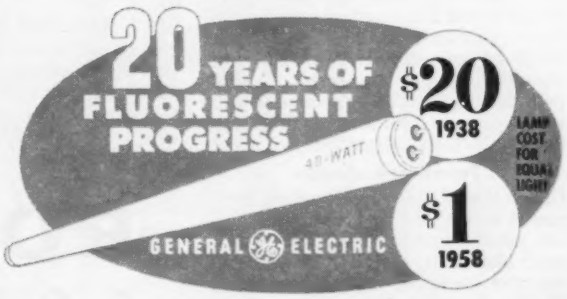
The first fluorescent, introduced 20 years ago this month by General Electric, can't hold a candle to today's G-E 40-watt Lamps. A steady stream of improvements from G.E. in Rapid Start and Pre-Heat Lamps has provided up-to-the-minute lighting systems for G-E Lamp users. Efficiency is up 76%, rated life is 5 times longer, and the list price is down 57%. *This means one G-E Fluorescent Lamp dollar today buys as much light as $20 did 20 years ago!*

NEWEST IMPROVEMENT—"BONUS PHOSPHOR". This revolutionary new G-E process gives your customers 7 to 9% more light by selecting only the bigger, brighter phosphors to be used in G-E Lamps. It is another dollar-and-cents reason why they get more for all their lighting costs with General Electric Lamps.

Progress Is Our Most Important Product

GENERAL ELECTRIC

This "Bonus Phosphor" is now available in the 40-watt and new Power-Groove—and will soon be used in all G-E fluorescent lamp types. For the whole "Bonus Phosphor" story—see or write your local G-E Large Lamp Salesman or write: General Electric Co., Large Lamp Dept.EW-48, Nela Park, Cleveland 12, Ohio.



In chemically active atmospheres like this . . . don't depend on ordinary sheathing materials

Continuity of power service often demands corrosion-resistant cable sheaths . . . like Roseal

What happens when your power cable in a refinery, steel mill, paper mill, or chemical processing plant fails from the deterioration caused by a highly corrosive atmosphere? You pay to replace the cable, your customer complains about downtime, and most important—*you lose power revenue.*

Now you can avoid power service interruptions in areas like those where the increased likelihood of cable breakdown presents a real problem. A new flame-retardant polyethylene compound—developed by Rome Cable—provides the kind of protective sheath you need in critical areas with oxidizing and corrosive atmospheres.

Tough new sheath

Called *Roseal,* this new sheathing compound makes long, uninterrupted service possible where heat, oils, acids, most chemicals, moisture, and oxidizing and corrosive atmospheres exist. Here's why:

1. Roseal resists oils, moisture, and most chemicals *even better than conventional nonmetallic sheathed cables.*
2. Its moisture-resistant characteristics are superior *to all other types of nonmetallic sheaths.*
3. Its flame retardance meets U/L original horizontal flame-test requirements.

Low-cost dependability

As an added benefit, in addition to its excellent properties, Rome's Roseal generally costs less than thermosetting sheaths. Roseal-sheathed cables are available with either aluminum or copper conductors and many types of insulations, including Rome's ozone-resistant oil-base (Rozone) or butyl-base (Rozone A) insulations. You can get single-conductor Roseal-sheathed cables in a variety of sizes from No. 8 AWG to 1,000 MCM, with grounded or ungrounded neutral, in standard voltage ranges from 3 to 15 KV.

For more information, contact your nearest Rome Cable representative—or write to Department 718, Rome Cable Corporation, Rome, New York.

FREE: New Technical Bulletin—describing in detail Rome's shielded high-voltage power cables—sheathed with thermoplastic Roseal—is now available. Just write for Bulletin RCD-700.

ROME CABLE

CORPORATION

The Management Newsletter

Report on
Electrical Business Outlook

I. How's Capital Investment?

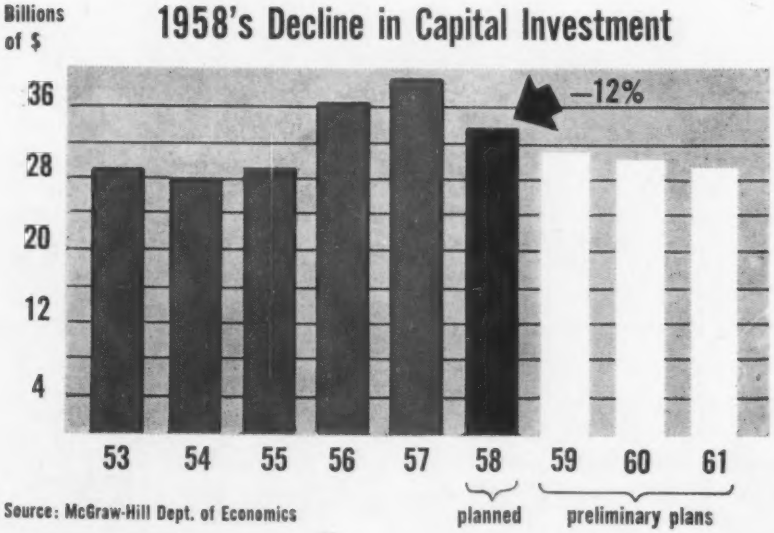
How far will industry cut its investment in new plant and equipment this year? When will capital expenditures start moving up again? What is the overall outlook for industry's sales, new capacity and research spending in the next few years? These were key questions posed in the latest McGraw-Hill survey . . . and here are some of the answers, as seen by the McGraw-Hill economists:

● **Capital spending will decline by about 12% in 1958,** or down to a level of $34 billion. Most companies have trimmed some more off the investment budget in the last few months (last fall's preliminary check on plans showed a 7% drop). As it now stands, investment will be off 18% in manufacturing, 3% in non-manufacturing industries.

● **But business plans to stabilize capital spending sometime in 1959** and maintain this new level in 1960-61. Advance plans for these years are almost as high as the rate of expenditures scheduled for late '58, so the investment slump should bottom out early next year. The worst of the drop is almost over. How much of a rebound—and just when it's coming—will depend on recovery in the general economy, corporate profits, and federal tax policy.

● **Investment plans are well below the maximum companies would spend,** if they're given favorable business conditions in 1958-61. But they are also above the minimum level these companies would spend if sales slumped substantially from the '58 level. This suggests that current investment does not reflect widespread fear of depression, but it does highlight the immediate problem of idle capacity.

● **Manufacturers have shifted much of their investment into modernization** and replacement projects, and away from further expansion. Modernization will



Source: McGraw-Hill Dept. of Economics

get 56% of the investment dollar in '58, and 62% in the period 1959-1961. In normal years, it runs about 50%.

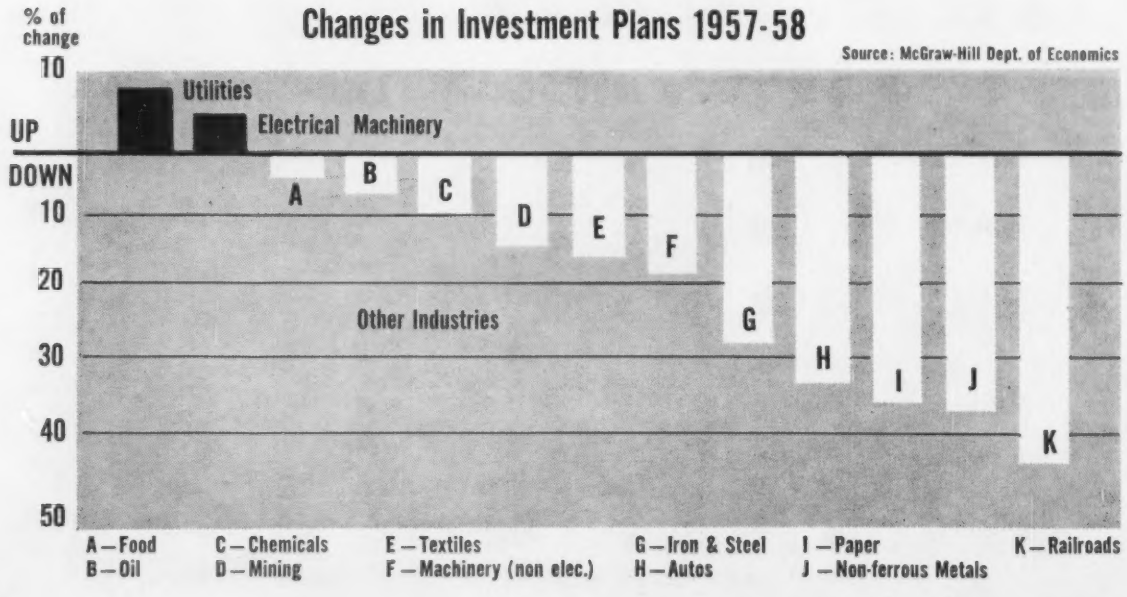
● **Industry is banking on a 20% sales rise over the next four years,** even though '58 sales will be down a shade. Companies report that they expect 12% of their 1961 sales to be in new products not on the market in 1957. Plans for research spending are up sharply, despite the uncertainties that have hit business.

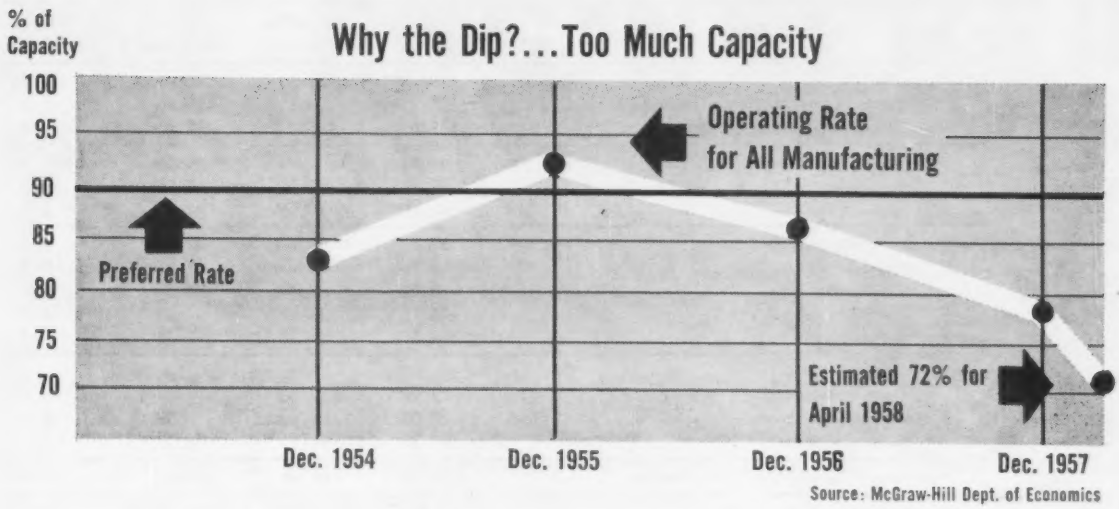
II. Electrical Industries Still Up

Investment by utilities and electrical manufacturers is still on the plus side. In fact, they are the only two groups who plan an increase in 1958 (see chart). Investor-owned companies plan to spend about $4 billion, up 7% from last year's record outlay. Manufacturers still see a 4% gain, which brings the '58 budget to $623 million. Preliminary plans for 1958-1959-1960 show $604 million, $652 million and $691 million, respectively. The appliance-radio-TV industry plans an 11% cut this year, but also a 26% rebound for 1958-1960.

Utilities have scheduled a moderate cutback in 1959 investment, which would be in line with past patterns in which power companies have lagged behind the general trend in capital expenditures. Advance plans for 1959-1961 come to an annual average which is 86% of the '58 budget. But companies say that, if conditions are favorable, investment for these years could be 20% higher than '58.

All other industries plan to cut their spending substantially in 1958. Autos, railroads, non-ferrous metals and paper lead the downward slide with cuts of over 30%. Iron and steel is off 29%, machinery off 18%, textiles off 15%, chemicals off 9%, food off 5%. Transportation equipment (i. e. aircraft, ships, etc.) are still off 3%, but this is better than the 16% slash planned last fall.





Source: McGraw-Hill Dept. of Economics

III. Too Much Capacity

Excess capacity explains most of the slump in investment spending and the big shift to modernization and replacement outlays. Some 6% of new capacity was put in during 1956, 5% in 1957, and another 4% is scheduled for this year. But with production falling off, industry's operating rate has slumped to less than three-quarters of capacity in recent months.

From 1958-1961, industry expects sales to go up about 20%, but plans to add only 14% of new capacity during this period. This will bring the operating rate back into the 80-85% range by 1961 or earlier. In the next four years, electrical manufacturers expect a 34% boost in unit sales (highest of any industry) but plan to put in only 18% of new capacity over the same period.

Investor-owned utilities plan to increase capacity by more than 30% in the next three years. More than 12 million kw will go in this year (as scheduled), with a slightly lower level planned for 1959 and 1960. Gross margin over last winter's peak (22.2% for the entire industry) isn't as high as it looks, since some of this reflects capacity to meet summer peaks.

IV. Research Still Booming

New technology lies behind industry's optimistic sales expectations. Research spending hit a record $7.3 billion in 1957, will shoot up another $1 billion this year. Most of the increase ties into the defense program. But electrical manufacturers plan a 9% hike in research and development outlays this year—up to $1.49 billion. Industry as a whole already has plans to do almost $10 billion worth of research by 1961—which is probably a conservative guess as to what it will actually spend.

The impact of research on capital investment is still very gradual—particularly on short term plans. But the number of companies who are building or adapting facilities to make new products is growing rapidly. And against this background the long run trend of capital investment looks decidedly optimistic.

POWER STATISTICS

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Dec.	128.74	127.51	120.44	6.9
Peak—Class I Systems, million kw	Dec.	107.1	.....	102.4	4.6
Estimated Dec. '58 Peak, million kw	Jan.	119.6	121.3	122.5	− 2.4
Production—billion kwhr	Dec.	54.03	51.79	52.88	2.2
Hydro		12.43	10.90	10.00	24.3
Fuel		41.60	40.89	42.88	− 3.0
Sales—billion kwhr	Jan.	50.07	48.62	49.21	1.7
Residential		15.80	14.45	14.45	9.3
Commercial		8.02	7.82	7.54	6.4
Industrial		23.75	23.87	24.73	− 4.0
Other		2.50	2.47	2.49	0.4
Fuel Consumption	Dec.				
Coal—million tons		13.92	13.62	14.77	− 5.8
oil—million barrels		7.05	6.68	8.27	−14.8
Gas—billion cu ft		91.35	93.11	81.37	12.3
Net Income Class A & B Co's—$ million	Jan.	137.15	140.68	124.84	9.9
Residential Customers—millions	12 mos.	46.86	46.77	45.71	2.5
Revenue per kwhr	ended	2.56¢	2.56¢	2.60¢	− 1.5
Avg kwhr per customer	Dec. 31	3,174	3,156	2,969	6.9
Avg annual bill		$81.25	$80.79	$77.19	5.3

SEE BELOW

FINANCIAL STATISTICS

Moody's Averages					
Public Utility Bond Yields	Mar.				
Aaa		3.67	3.62	3.71	− 1.1
Aa		3.73	3.68	3.80	− 1.8
A		4.13	3.96	4.05	2.0
Baa		4.25	4.23	4.25	—
24 Utility Stocks					
Price	Mar.	$54.16	$53.27	$49.88	8.6
Earnings (latest qtr)	Dec.	3.41	3.42	3.35	1.8
Dividends (annual rate)	Mar.	2.46	2.46	2.42	1.7
Yield (%)	Mar.	4.54	4.62	4.85	− 6.4

BUSINESS STATISTICS

Indexes: 1947–49 = 100					
FRB Industrial Production	Mar.	129	131	148	−12.8
ENR Construction Cost	April	156.3	156.1	148.7	5.1
BLS Cost-of-living	Feb.	122.5	122.3	118.7	3.2
New Orders for Machinery (1950 = 100)	Feb.	124	122	156	−20.5
NEMA Sales					
Insulation materials	Feb.	106	115	146	−27.4
Electric appliances		77	74	94	−18.1
Wholesale prices					
Motors and generators	Jan.	144.0	143.3	140.2	2.7
Transformers and regulators		148.3	149.2	146.6	1.2
Switchgear and fuses		171.3	171.2	164.4	4.2
GNP—annual rate—$ billion	4th qtr.	432.6	440.0	426.0	1.5

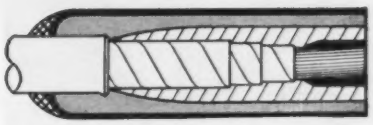
Indication of underlying strength in industrial energy sales can be seen in comparison with the Federal Reserve Board industrial production index for January. While FRB index skidded 9%, industrial kwhr sales slumped only 4%.

THE RIGHT CABLE JOINT FOR YOU

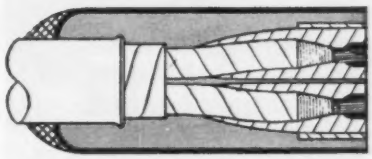
PRE-ENGINEERED

FOR LOW COST AND HIGH QUALITY

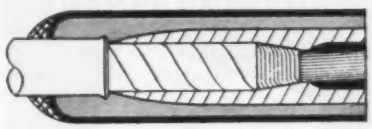
The joint design you need is most likely among the thousands of up-to-date pre-engineered designs in G&W files. They represent a thorough knowledge of the requirements of allied equipment used in power distribution.

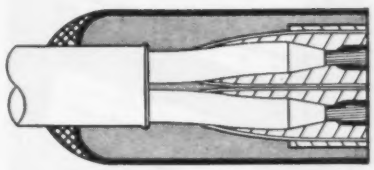


The result at G&W is a keen appreciation for the need of designing cable joints and supplying materials that are best suited to a particular type of cable.

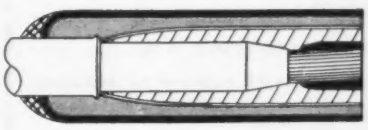


We can select the design you need in minutes. You save expensive time for engineering and ordering. G&W pre-engineering is complete to the last detail. Specifications, drawings and instructions cover the materials and the proper procedure for preparing a joint. They include each step from removing the sheath to making the splice and applying, when necessary, the protective cover or casing. This data is enclosed in the convenient unit package of materials you receive to make each joint.





Only the best quality materials are supplied by G&W. Overages are estimated to make reasonable allowances for variations of individual handling by splicers.



Do the job right the first time. Order G&W pre-engineered cable joints. Call a G&W representative for full details or write us for Bulletin JA56.

G&W ELECTRIC SPECIALTY COMPANY
3500 WEST 127TH STREET • BLUE ISLAND, ILLINOIS

CANADIAN MFR. • POWERLITE DEVICES, LTD. • TORONTO, MONTREAL & VANCOUVER

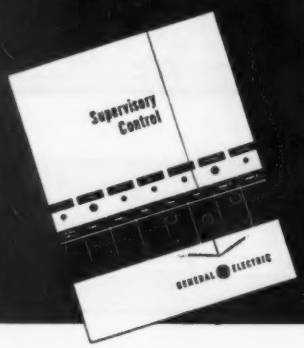
J581

SUPERVISORY CONTROL

New remote operation economy regardless of control distance for:

- power distribution
- motors
- valves
- pumps
- industrial water systems
- any piece of electrical apparatus which has provisions for local control

FREE BULLETIN!



SECTION D513-8
GENERAL ELECTRIC CO.
SCHENECTADY 5, N. Y.

I'd like full details on the application of General Electric Supervisory Control Equipment.

NAME_____

COMPANY_____

STREET_____

CITY_____

STATE_____

Progress Is Our Most Important Product

GENERAL ELECTRIC

Can You Afford Old Transformers?

(*Continued from page 70*)

1919-1940 unit would total $123.00. This figure represents a core-loss saving of $11.22, a copper loss saving of $4.17, and an excitjng current saving of $107.61. Total savings indicate that repair work on any transformer built before 1940 would be uneconomic.

What about replacing defective core and coil assemblies with the new universal assemblies, especially where tank and bushings appear to be in good condition? Here a new set of factors enter. First, the tank and bushings must be recognized as important in an integrated design.

Proper impulse levels and thermal characteristics depend to a great extent on the coordinated design of the core-and-coil assembly and the tank.

Some utility records indicate that rebuilt transformers have considerably shorter life expectancy than new ones so that serious consideration is warranted before additional capital is added to a defective or burned-out transformer.

FPC Reports 1,224 Mw Net Capacity Gain

PLANT ADDITIONS DURING DECEMBER

State	Utility	Plant	Fuel	Capacity
Ariz.	Salt River Project Agricultural Improvement Power District	Agua Fria No. 2	S	100,000
Calif.	Pacific Gas & Electric Co.	Vallecitos	S-N	4,900
Fla.	Vero Beach Municipal Power Plant	Vero Beach	IC	5,400
Ill.	Commonwealth Edison Co.	Northwest	S	35,000
Kan.	La Crosse Electric Dept.	La Crosse	IC	700
Kan.	Kansas City Board of Public Utilities	Kaw	S	44,000
Me.	Central Maine Power Co.	Yarmouth	S	44,000
Mass.	Boston Edison Co.	Mystic	S	125,000
Minn.	Public Utilities Commission	Hawley	IC	675
Mo.	St. Joseph Light & Power Co.	Lake Road	S	25,000
Neb.	Hastings Utilities Dept.	North Denver	S	16,500
N. J.	Public Service Electric & Gas Co.	Linden	S	150,000
N. Y.	Niagara Mohawk Power Corp.	C. P. Huntley	S	200,000
Ohio	Columbus & Southern Ohio Electric Co.	Conesville	S	125,000
Ohio	Ohio Power Co.	Muskingum R	S	225,000
Ore.	Portland General Electric Co.	Pelton	H	36,000
Pa.	Duquesne Light Co.	Shippingport	S-N	100,000

RETIREMENTS

Mo.	Arkansas-Missouri Power Co.	Caruthersville	IC	750
Mo.	Missouri Power & Light Co.	Moberly	S	2,000
Mo.	Bethany Municipal Utilities	Bethany	IC	240
N. H.	New Hampshire Electric Co.	Portsmouth	S	3,500
N. Y.	Niagara Mohawk Power Corp.	Volney	H	340
N. C.	Duke Power Co.	Portable No. 2	IC	500
Ohio	Ohio Edison Co.	Lowellville	S	15,000
S. C.	Duke Power Co.	Portable No. 2	IC	500
S. D.	Montana-Dakota Utilities Co.	Camp Crook	IC	65
S. D.	Montana-Dakota Utilities Co.	Lemmon	IC	252
S. D.	Northwestern Public Service Co.	Redfield	S	600
S. D.	Northwestern Public Service Co.	Huron	IC	336
Tex.	Robstown Lighting & Power Dept.	Robstown	IC	800
Wis.	Northern States Power Co.	Menominie	H	12,000

U. S.	Hydro	Steam	IC	Total
Added	36,000	1,194,400	6,775	1,237,175
Retired	1,540	21,100	3,443	26,083
Adjustments (plus)	8,300	5,500	.....	13,800
Adjustments (minus)	.....	500	15	515
Net Change	42,760	1,178,300	3,317	1,224,377

H—Hydro, S—Steam, IC—Internal Combustion, S-N—Steam, Nuclear Plant
U. S. Capacity as of January 1—Hydro, 26,951,037 kw; Steam, 99,266,415 kw; IC, 2,520,012 kw; Total, 128,737,464 kw

REGISTERS GIVE LOWEST COST DEMAND METERING

This mechanical register gives meter men accurate demand metering at a lower cost than with any other type of demand device. Low cost is vital now as more demand metering becomes needed to meet the growing number of short-term, high-peak loads. That's why meter men in increasing numbers are finding real savings by using General Electric demand registers. There are savings on costly inventories as high as 30% because with registers, any watthour meter can be quickly and easily converted to a demand meter as accurate as the watthour meter itself. Easy conversion of registers to different scale classes, ratings, and time intervals makes possible substantial savings in operating costs. Testing costs are lower too. Registers can be tested in the field—there's no need for expensive shop testing as with other types of demand devices. See these savings yourself. Ask your General Electric Apparatus salesman to show you the facts on demand registers—the lowest cost way to accurate demand metering. Or, write to the General Electric Company, Section 628-3, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

New Appliances for Old at IP&L

A free appliance replacement program for schools in the Indianapolis Power & Light Co's service area is helping students to learn the advantages of electric living.

Under the plan, which is sponsored by IP&L and appliance manufacturers, modern electric appliances are sold to schools at a low price and replaced each year with new models at no extra charge. It was inaugurated in August 1956 and is available to all schools in the company's service area. To date, 39 have taken advantage of the program and have received 156 electric appliances.

Many home economics departments have installed dishwashers, water heaters, and garbage disposers, even though they do not come under the replacement program.

APCO Towns Reach for New Kwhr Award

E. A. **WILSON**, General Sales Manager, Alabama Power Co, Birmingham, Ala.

Alabama Power Co has inaugurated a series of awards for the first 10 local operations that attain an average annual use of 5,000 kwhr or more per urban residential customer. Two towns have been honored.

This new award replaces one previously given for average annual use per customer of 4,000 kwhr. Ten local operations had reached this goal by 1954. Now the number has grown to 50.

To those attaining the 500-kwhr goal the company will present a bronze plaque. It reads, "Presented by Sales Department, Alabama Power Company, To The (name of town) Operation For Excellence In Promoting LIVE BETTER . . . ELECTRICALLY And Attaining An Average Annual Use Of 5,000 Kilowatt Hours Per Urban Residential Customer."

First to obtain the award was the 3,491-customer Jasper operation which attained a 5,046 kwhr average. Next was the Jackson operation which reached a 5,014 kwhr average based on 1,235 customers.

Future awards will be made quarterly. Should any local operation attain an average of 6,000 kwhr per customer before 10 plaques have been awarded, this goal will be used for future awards.

CIPS Campaign Sells 34,867 Bags of Bulbs

Sale of 34,867 bags of six light bulbs each was the result of recent promotion by Central Illinois Public Service Co., reports sales manager B. L. Palm. The promotion was designed to have the selling job done by community organizations such as Boy Scouts, Girl Scouts and other groups.

Each bag contained two 60-w, two 100-w, one 75-w and one 150-w bulbs. The bulbs (bagged) were furnished by local lamp dealers in the area. CIPS paid the dealers full list price for the 150-w bulb which went free, as a bonus with the sale, to the customer. Customers paid list price for the other five bulbs. CIPS paid the community organization handling the sale 25 cents for each bag of bulbs which it sold.

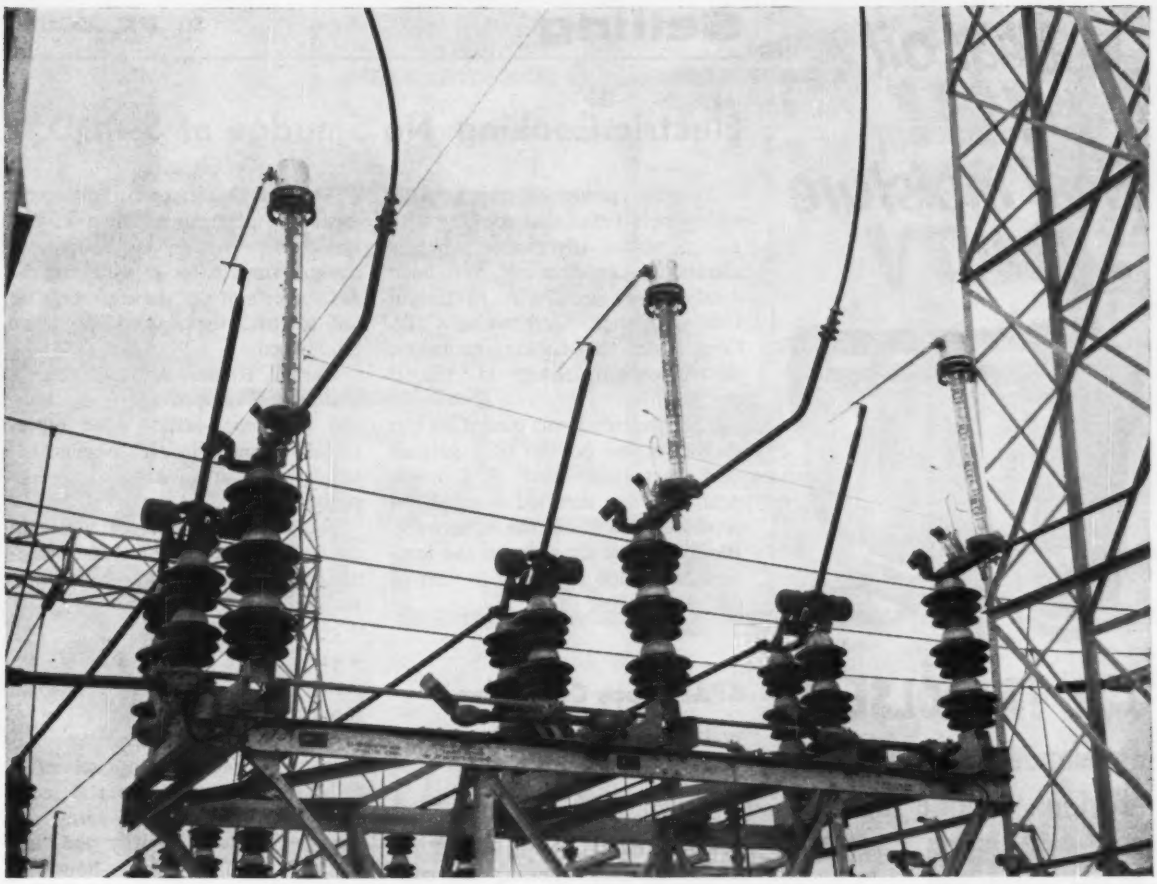
Champion selling job was done by the Effingham (Ill.) High School Student Council. They sold 1,500 bags of bulbs. Newspapers in Effingham carried stories on the promotion and Stevens' Hardware store, the local lamp dealer, paid the student council 50 cents per bag, in addition to the 25 cents per bag paid by CIPS. The fund went for the foreign student exchange program of 1958.

Several communities sold 600 bags of bulbs. The Marion Teen Town sold 750 bags and the Harrisburg School band sold 1,074.

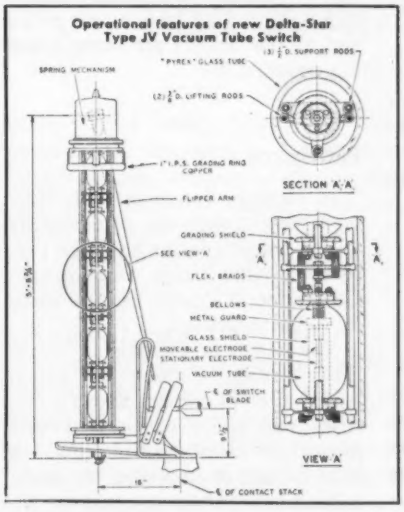
GE Outdoor Lighting Book

General Electric Co's Large Lamp Dept has published a "How-To Book of Outdoor Lighting Promotion," a result of two year's observation and study of the residential outdoor lighting market. The book was tailored as an integral booster for such programs as the LBE Medallion Home, and is intended as a planning guide for the utility to help the homeowner to extend his lighting and living outdoors.

(*More Selling on page* 104)



FOR INTERRUPTING HIGH LOAD AND CAPACITIVE CIRCUITS



—the DELTA-STAR MKV-40 Vacuum Tube Switch

RATINGS UP TO 138kv. The new Delta-Star MKV-40 Vacuum Tube Interrupter Switch answers the need for a high-voltage, high-current interrupting device of long service life at reasonable cost.

Especially well suited for switching capacitive loads, the MKV-40 operates on a thoroughly proved principle whereby the series of high-dielectric-strength Jennings vacuum tubes is in the circuit only during the interrupting cycle. Tubes are also relieved of the duty of re-making the circuit. Long, reliable service life is thereby designed into this high-current interrupter.

Positive interruption occurs at first current zero, and restrikes are eliminated by the high dielectric strength of the vacuum switch. The vacuum tube switch is maintenance-free throughout. Currents as high as 600A (load) and 200A (capacitive) may be handled with an expected service life of 5,000 operations.

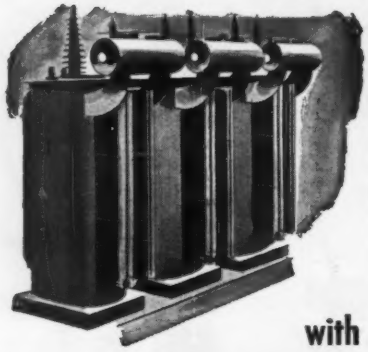
For prints and technical literature, call your nearest Delta-Star representative, or write today direct to *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.*

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

Seal oil IN!
Seal moisture OUT!



with
J-M TRANOLSEAL
developed especially for efficient sealing against

refined oils

You can stop the dangerous and costly leakage of oil from transformers and switchgear with Johns-Manville's Tranolseal sealing compound. This permanently plastic material has a nondrying vegetable oil base. It provides effective sealing action against air (dust and moisture), inert gas, water, 13% NaCl brine as well as medium to high viscosity refined oils. Thus you can also prevent penetration by moisture and other ambient sources of trouble.

Tranolseal has excellent adhesive qualities and will not corrode or deteriorate metals, rubber or plastics. It shows good resistance to weather and aging (both painted and natural) and won't stain. Furnished in 1" diameter beads. For further information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

Johns-Manville
SEALING COMPOUNDS

Electric Cooking: No Smudge at SMUD

Tests to prove or disprove the widely-held belief that cooking with gas tarnishes silverware, whereas electric cooking does not, have been conducted by Sacramento Municipal Utility District, Sacramento, Calif. Conclusion: Gas cooking tarnishes; electric cooking results in little, if any, tarnish.

The silverwear was placed on two shelves at the bottom of a galvanized sheet metal hood. A deflector near the top directed combustion products down on the silverware. Blocks of dry ice reduced the temperature inside the hood to that of the surrounding room.

The cooking time for a typical meal was determined; then 45 full meals were figured as a month's cooking time. After 45 cycles on the gas stove, and the same process on the electric, the conclusions were established.

Carl L. Richey, assistant general manager developed the tests. Harold R. Wine, senior sales representative, and Virgil R. Semas, administrative aid, conducted the experiments.

Sacramento Municipal will add the no-tarnish feature to future electric range advertising and promotion material.

KP&L Woos Customers with Cooking Center

Kansas Power & Light Co's Topeka Division accomplished a double purpose with a showing of a Custom Trend Cooking Center recently. Besides whetting the consumer's appetite for 1958 electric ranges, water heaters, dryers and other appliances, the Division pointed out what the future likely holds for electric cooking.

The Center was built by Hotpoint Co, and features built-in electronic and conventional ovens (with sliding steel and glass doors controlled by push buttons), disappearing surface units, and a disappearing ventilation and illumination bar.

Carrier Seeks to Establish Btu as A.C. Rating

Carrier Corp has begun a campaign to have Btu's used exclusively as the measurement standard for room air conditioners, and to signify the end of horsepower ratings.

Russell H. Gray, vice president and general manager of the Unitary Equipment Div, says the company will conduct an educational program for its dealers and customers to show them the inconsistencies of horsepower designation, as used by some room unit manufacturers.

Carrier will discontinue, as quickly as practicable, all reference to horsepower on its room air conditioners. "Henceforth," Gray declares, "we will identify the unit size by certified Btu-per-hour capacities, as recently put forth in a standard adopted by the Air Conditioning and Refrigeration Institute. All advertising and printed literature will conform to this new policy and all our dealers are being asked to cooperate."

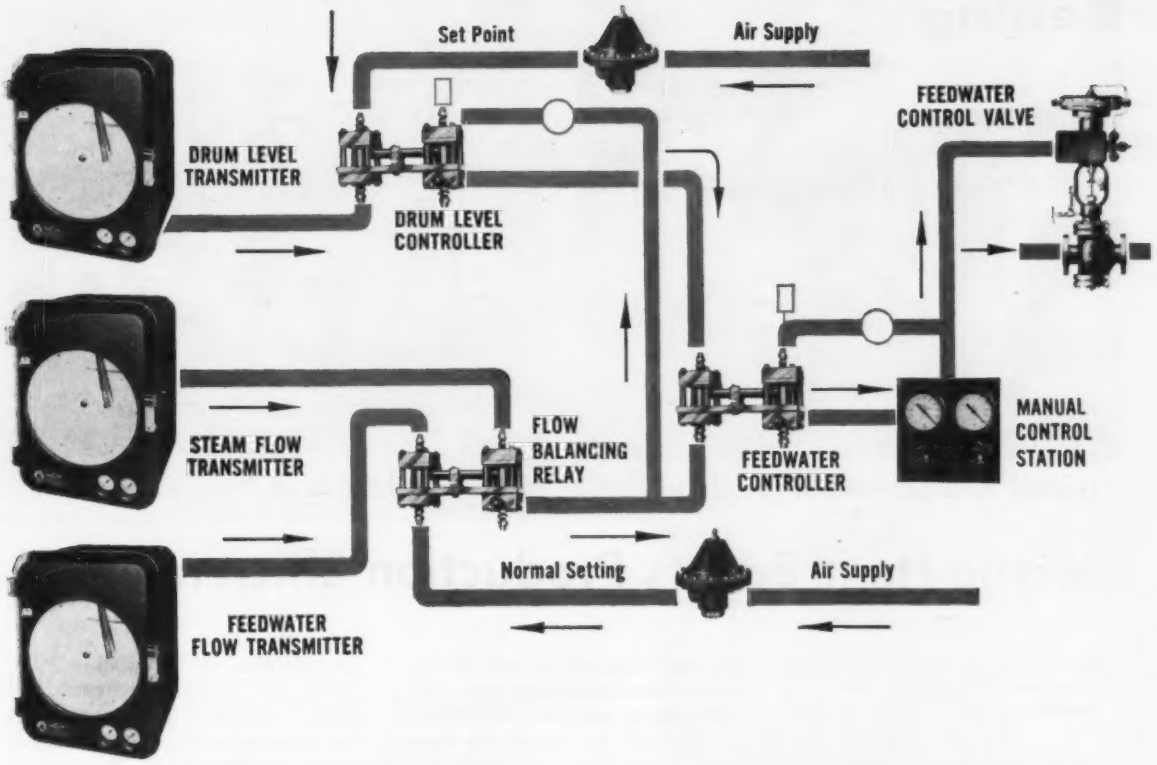
EEI Farm Aids

A catalog of movies and slides promoting greater use of electricity on the nation's farms has been prepared by the Farm Development Committee of Edison Electric Institute's Farm Group.

The 14-page booklet, "Farm Electrification Catalog of Visual Aids," lists 41 movies and 12 film strips and slides which deal with phases of farm electrification. A brief resume of each film, the price, and where it can be obtained, are included.

Write Commercial Division, EEI, 420 Lexington Ave, New York 17, N. Y. Price per copy: One to five books, $0.50; more than five, $0.35.

(*More Selling on page* 106)



Hagan 3-Element Feedwater Control features compensated measurements and Automatic Level Monitor

Modern boiler design demands a higher degree of accuracy and response in feedwater control. The Hagan 3-element system meets this demand by providing exceptional precision of measurement and flexibility in interpreting measurement into action. Here are some reasons why the Hagan system is outstanding:

COMPENSATION—The three major measurements—drum level, feedwater flow and steam flow—can be made with Hagan Ring Balance meters compensated for variations in fluid density. This permits maintenance of accurate automatic control over a wider range of operating conditions, especially at start-up and shut-down.

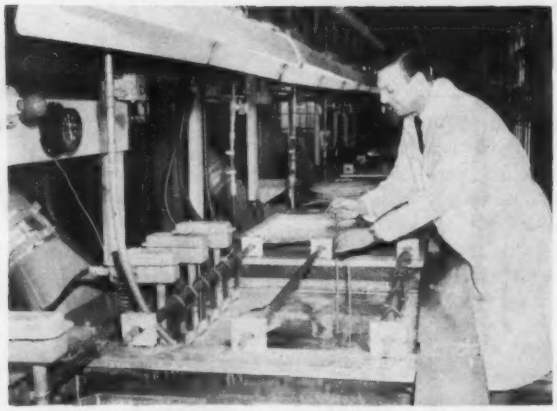
WIDE-RANGE ADJUSTMENT—The use of wide-range Hagan Ratio Totalizers as flow-balancing relays and controllers allows independent adjustment of the influence of each variable. This provides flexibility and accuracy in matching the control system to boiler and load characteristics.

AUTOMATIC LEVEL MONITOR—holds drum level at the set point by compensating for discrepancies between steam generated and steam measured. In ordinary 3-element systems the level is depressed or elevated by such discrepancies as, for instance, during blowdown or steam soot-blowing when steam is being used which is not measured by the steam flow meter.

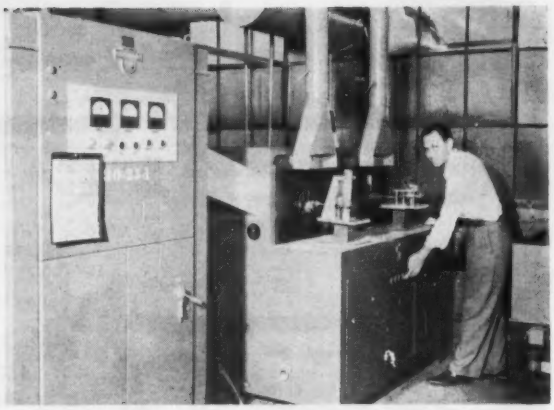
LEVEL INFLUENCE FROM BOILER LOAD—can be incorporated to hold level above normal at high loads and below normal at low loads. Write for Bulletin MSL-3, which describes such an installation on a 400 Mw station.

HAGAN CHEMICALS & CONTROLS, INC.

HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO



Assuring accurate control for plating . . .



and proper heat level for brazing . . .

Electric Heat Boosts Production Efficiency

L. ALBERTSON, Supervisor Sales Applications Dept, Philadelphia Electric Co, Philadelphia, Pa.

Dependable, easy to control electric heaters proved to be the key to more efficient production and a better quality product at the Atlas Precision Products Co in Philadelphia. The compact units permit an ideal, straight-line arrangement of electroplating and rinsing tanks and provide continuous operation with a minimum of attention. Maintenance expense on the electrically heated units is low, too.

Used for silverplating and processing aluminum and brass components for communication equipment, the heaters total 98 kw in capacity. They are thermostatically controlled to maintain 80 to 85 F temperatures in the plating bath, 180 to 190 F in the water rinse, and other selected temperatures in the electrocleaning solution, alkali etches, and rinses.

Another important application of electric power at Atlas is a 48-kva 400-kc induction heater which permits the company to braze metal parts without distortion or loss of time in finishing operations.

Electric Heating Cable Beats Time and Weather Problems

TED W. BEADLE, Industrial Engineer, Washington Water Power Co, Spokane, Wash.

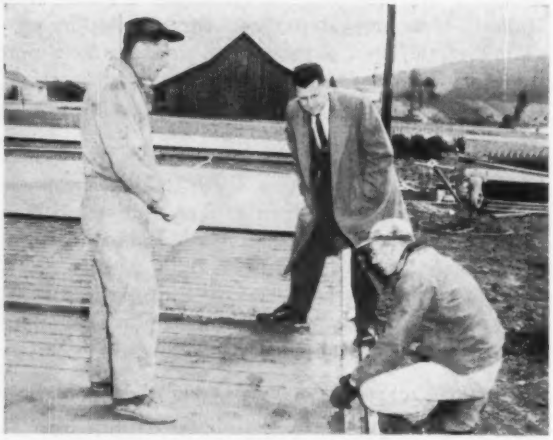
Old Sol is getting a helping hand from electric heat in an unusual produce drying job at the Jacklin Seed Co, Dishman, Wash. Heating cable, imbedded in the concrete slabs on which high quality grass seed is dried, has cut drying time sharply and made the process less vulnerable to climatic conditions.

Using 5 watts per sq ft, the 100 x 100-ft slab draws a total of 50 kw. Cable is No. 22 chlorprene insulated type, rated 2.75 watts per ft. It operates at 240 v.

The installation has exceeded everyone's expectations. Seed can now be completely dried in 4 to 6 hr, when 10 to 12 would have been satisfactory. Sixteen tons of seed can be dried at one time.

In past years, Jacklin relied on the heat of the sun alone to dry the seeds. During drying, seeds had to be turned frequently.

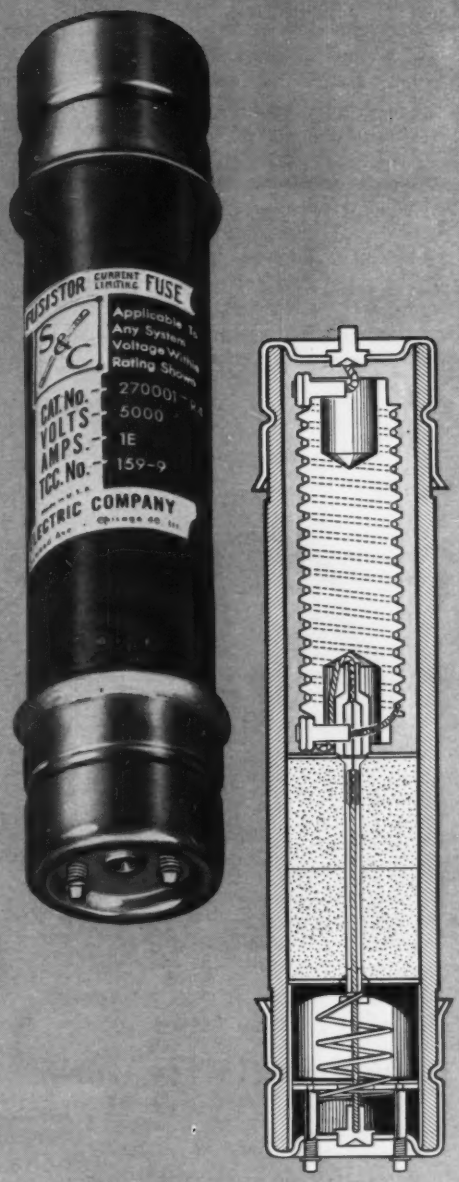
Before the installation was made, it was assumed that the heating cable would supply part of the energy



to vaporize the water content in the seeds. Now it is apparent that it is only necessary to supply enough heat to keep slab and seeds above the dew point.

for potential transformers...

S&C's new Fusistor, a universal current limiting fuse



UNIVERSAL because it is not critical as to system voltage. For example, the 14.4 kv Fusistor will take care of all system voltages down to 2.4 kv without impairment of its interrupting ability, and without inducing excessive transient overvoltages during interruption. Contrast this with other current limiting fuses which must be applied between 70% and 100% of nameplate voltage rating.

UNIVERSAL because it fits all mountings, regardless of make. And just two ratings (different clip centers) will take care of most indoor potential transformer protection needs at 14.4 kv and below. There's no need to stock a rating for each system voltage.

HERE'S WHY: The Fusistor interrupts faults even at voltages substantially below its rating because of the inherent operating characteristics of its current limiting section (upper half of cutaway drawing, right). It uses helically coiled molybdenum wire, in turn helically coiled on a ceramic core, embedded in silica sand. Molybdenum has a high resistance even under normal conditions, and when fault current flows, its resistance increases rapidly. Thus, the Fusistor responds immediately to the fault, and—because of molybdenum's high melting temperature—its current limiting action continues longer. And when the molybdenum does melt, there is a less pronounced "chopping" of the current.

In the lower half of the Fusistor is a separate circuit interrupting section. Using time-tested boric acid, it *positively* interrupts even the lowest faults. And on maximum faults, both sections combine to limit and interrupt the current. The Fusistor thus gives positive protection over the full range of fault currents.

Fusistors rated 4.8 kv and higher have two plunger indicators (shown at the bottom of both views) which drop down to show that the fuse has blown.

S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Rd., Toronto 14, Ont.

Power Fuses
Distribution:—
Disconnects
Cutouts
Fuse Links
Loadbuster
Load Interrupters
Metalclad Switchgear

S&C ELECTRIC COMPANY

News About People

NEES Unit Advances Lother to VP Position

Elmer H. Lother has been elected as vice president and comptroller of the New England Power Service Co, a subsidiary of the New England Electric System, Boston.

Lother's background in the utility field dates back to 1920, when he joined the Narragansett Electric Co in Providence, R. I. By 1928 he had advanced to auditor of that utility. Two years later he transferred to Boston, where he was made assistant general auditor of New England Electric System.

His 1935 appointment as auditor of all the retail companies in the system was followed in 1941 by his elevation to auditor of the New England Power Service Co. Three years later Lother became assistant treasurer of all system companies in the north Boston area. In 1951 he was named treasurer of Narragansett Electric, which post he held until his current appointment.

ELMER H. LOTHER

Baudino Assumes VP Duties

Western Colorado Power Co has announced the recent election of L. J. Baudino to the position of vice president and general manager of the utility.

In his new capacity Baudino succeeds J. A. Bullock, who retired on April 1 after having served in that position for approximately 11 years.

Baudino has been assistant general manager of the Utah Power & Light Co subsidiary since 1952. An electrical engineering graduate of the University of Colorado, he has been associated with Western Colorado Power since 1935.

L. J. BAUDINO

NEMA Elects Treasurer

National Electrical Manufacturers Assn has elected J. R. MacDonald as treasurer for the ensuing year. MacDonald, board chairman and president of General Cable Corp, fills the vacancy created by resignation of B. C. Neece, president, Landers, Frary & Clark.

MacDonald is a member of NEMA's Program and Budget, and Officers Committees.

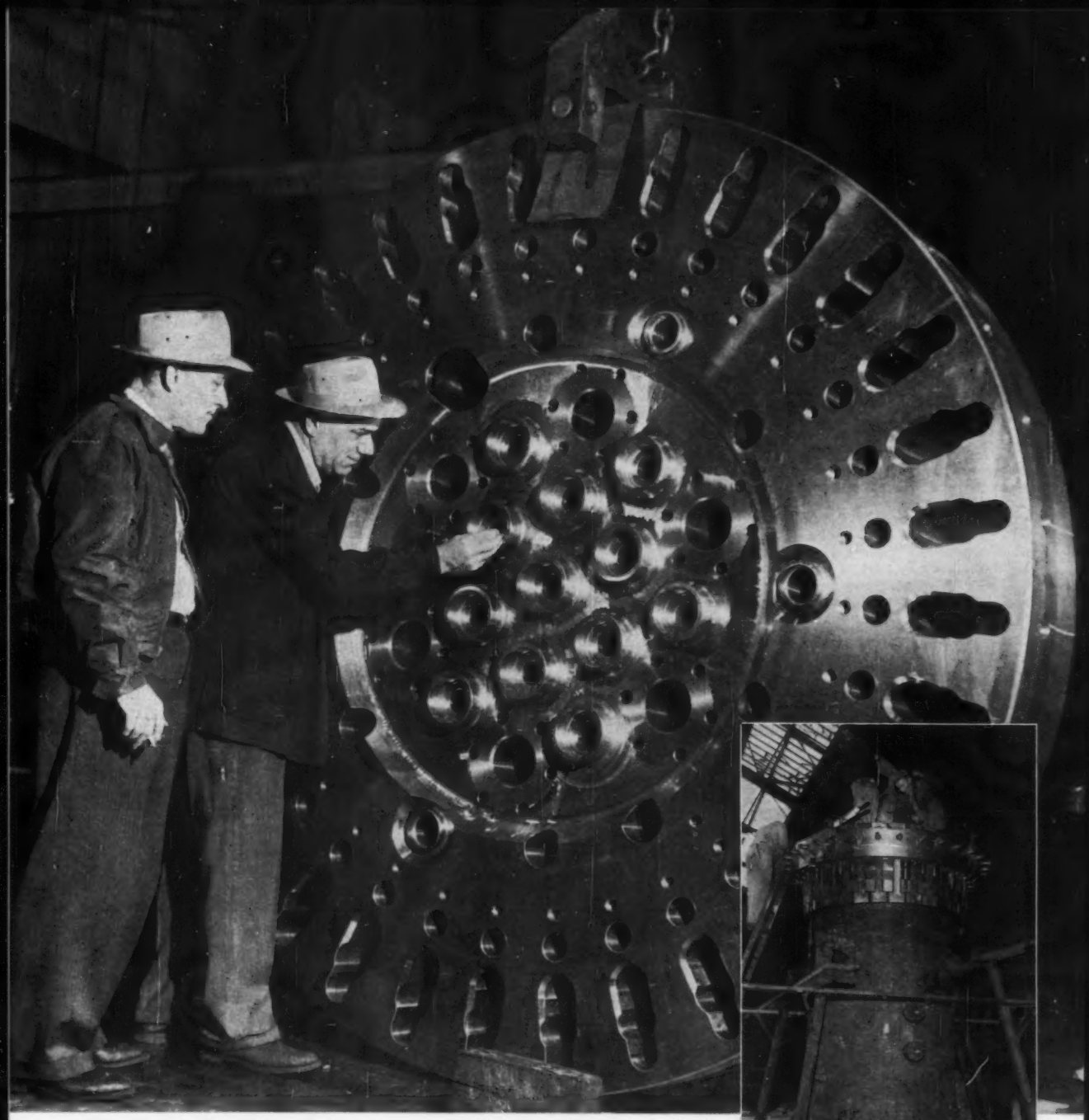
J. R. MACDONALD

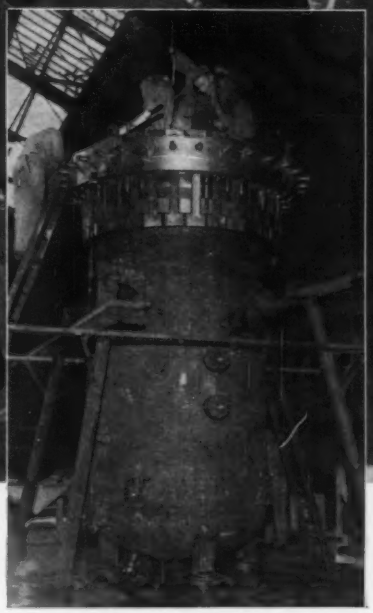
NEW Chairman Named

The new chairman of the National Electrical Week Committee is N. J. MacDonald, president of Thomas & Betts Co. He succeeds Merrill E. Skinner, Union Electric Co VP and director of sales, who headed NEW for three years.

MacDonald, also VP and board of governors member of NEMA, said NEW plans "a strong observance for 1959."

N. J. MACDONALD





This pressure vessel had to be designed with a closure that would open in 30 minutes, and withstand 1500 psi, 550F. Made of Type 304 stainless, the top head has 34 connections, of which 19 required exceptionally close tolerances for control rods.

FOR NUCLEAR NEEDS of Knolls Atomic Power Laboratory, M. W. Kellogg was given the exacting assignment of designing and producing a 32½-ton "Proof Test Reactor Pressure Vessel". This was an unusually complex task, because of the quick-opening closure specifications, requiring a head with novel design and extremely close tolerance machining.

FOR NUCLEAR NEEDS of others, Kellogg is supplying the primary coolant stainless piping for two nuclear plants. In addition, Kellogg is equipped to engineer and manufacture heat exchanger equipment for nuclear energy power plants. If these specialized skills suggest a solution to *your* nuclear problems, call Kellogg's Fabricated Products Sales Division.

THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Limited, Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York
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M KELLOGG W

WRIGHT
Type "R" Pull-A-Ways

WEIGH LESS THAN 9 POUNDS

Write for Bulletin DH-521A

5-foot double strand, 3000-lb. pull

14-foot single strand 1500-lb. pull

Sturdy • Light • Safe • Economical

Here are some of the fine features of WRIGHT Type "R" Pull-A-Ways:

Drop forged ductile aluminum alloy frame • Wire hoist cable of maximum strength and flexibility • 8" minimum handle movement—for close hook-ups • 2" drum hub for cable • No oiling needed • Drop forged steel hooks • Removable, reversible "Safety Handle" that bends before any part of hoist is overloaded • Automatic load lowering, with positive control for safety. ACCO

Write our York, Pa., Office for Bulletin DH-521A for full story

Wright Hoist Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • York, Pa.

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.
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BUILDERS OF DEPENDABLE EQUIPMENT SINCE 1920
UT & BCo.

COATES Field Service, INC.
P. O. Box 1581 Okla. City

Thoroughly Specialized
RIGHT-OF-WAY ACQUISITION
From Title Search . . . To Damage Claims

C-H Executives Named to New Posts

J. M. COOK

P. S. JONES

Cutler-Hammer, Inc, has promoted J. M. Cook from sales manager of industrial control divisions to vice president of marketing, and appointed P. S. Jones, former VP-sales, as senior vice president.

The appointments, made in anticipation of Jones' planned retirement at the end of this year, give Cook direction of all sales functions for the firm.

PERSONAL BRIEFS

Louisiana Power & Light Co has made the following four promotions in its newly-created industrial sales and area development sections: **R. A. Cuyler** became director of the industrial sales and area development sections; **Tom D. Hoskins** was named industrial sales manager; **Joseph M. Mooney** was made manager of the new area development section; and **A. J. Rhodes** is the new assistant manager of the area development section.

Yukon Electrical Co, Ltd, and the Yukon Hydro Co, Ltd, have named **E. W. King** general manager.

W. Truslow Hyde, Jr, formerly partner and public utility analyst for Josephthal & Co, has been admitted as a general partner in F. S. Smithers & Co, One Wall St., N. Y.

Association for Applied Solar Energy has appointed **John I. Yellott** executive vice president. **Virginia Glass** has been promoted from administrative assistant to assistant treasurer. A new staff member is **E. L. McLean,** New York, named vice president for development.

Edison Storage Battery Division, Thomas A. Edison Industries, has named **James A. Mustard, Jr,** general sales manager. **J. Walter McCann** has become manager of the Boston sales territory, succeeding **Howard W. Teter,** retired.

General Electric Co has made these new appointments: **Sydney O. Johnson** has become manager of transistor advance and design engineering; **Martin E. Clark** has been promoted to manager of transistor product engineering, semiconductor products dept; and **Carl W. Pinkham** has been appointed manager-instrument transformer engineering at GE's instrument department. **William A. Reich** has been made manager of the engineering section, metallurgical products department.

Henry E. Bowes has been elected vice president-marketing of Philco Corp. . . . Jasper Blackburn Corp has named **Wilbur A. Everingham** controller.

Hi-Line Hardware Division of the Brewer-Titchener Corp has appointed **Frederick G. Goldner** product development engineer.

Kaiser Aluminum & Chemical Corp has made the following six management appointments in the recently established Electrical Conductor Division: **J. C. Ferguson,** product manager; **R. J. Harrison,** assistant product manager; **H. F. Johnson,** administrative manager; and three program coordinators including **J. A. Leuver,** industrial, light, and power; **H. H. Weber,** utilities; and **P. W. Ward,** distributors and warehouses.

R. J. Phillips is new production manager at the Southern States Equipment Corp.

The Fox River Valley Subsection of the Milwaukee Section of American Institute of Electrical Engineers has now been officially recognized as the Northeastern Wisconsin Section. Chairman is **Edward F. Woytych** of Gidding & Lewis Machine Tool Co.

SALES ASSIGNMENTS

COMPANY STAFFS

M. W. Kellogg Co has appointed Donald B. Valk as sales engineer in the Fabricated Products Division.

Okonite Co has named Robert B. Zane to the newly-established office of manager, utilities and industrials, at the Chicago office. Clifford B. Sass, Jr, will handle Zane's previous post as manager, railroad sales, in the Chicago district. Elbridge H. McNeill has become regional sales manager of the newly-former Mid-West sales region which covers Chicago, St. Louis, and Rocky Mountain sales areas.

Pittsburgh Reflector Co has appointed Paul Angrick as sales representative for the Indianapolis area.

H. K. Porter Co's Delta-Star Electric Division has opened two new district sales offices. The Minneapolis office, at 539-40 Plymouth Building, 12 South 6th St, is managed by C. W. "Scotty" Swanson. The Boston office at 1210 Little Building, 80 Boylston St, was opened under the management of John J. Russell.

Quaker Rubber Division of H. K. Porter Co, Inc, has named Everett G. Harvey as sales engineer.

Reliable Electric Co has appointed Wallace H. Johnson to its sales staff. He will be located at 4350 North Central Expressway, Dallas 6, Tex., and will represent the company in Texas, New Mexico, Louisiana, and southern Mississippi.

R T & E Corp has named these direct sales representatives to handle the company's line of distribution transformers and protective equipment: Patrick H. Leathem will be located at 146 Tyrone Drive, N. W., Albuquerque, N. M., and will cover Arizona and New Mexico; Robert H. Korman, at 504 East 48th St, Indianapolis, Ind., will cover both Indiana and Illinois, and Herschel L. Mooney, at 2675 Hillcrest, Medford, Ore., will handle the state of Oregon.

SpeedWay Division of Thor Power Tool Co has named Edward T. Michalek assistant sales manager.

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G. W. EVANS, Kansas G&E, as conference chairman, welcomes incoming secretary-treasurer, D. B. McGregor, Arizona Public Service; Vice-chairman W. A. Parish, Houston L&P; Chairman-elect M. L. Kapp, Interstate Power Co

Cites Energy Prospect in Fusion

Southwest Electric Conference speaker says deuterium is sufficient to supply world's requirements for many years

The 0.02% deuterium found in nature is sufficient to supply the world's energy requirements for many years to come, H. R. Hallock, Texas Atomic Energy Research Foundation, told the Southwest Electric Conference recently at Chandler, Ariz. Fusion of deuterium involves several reactions all of which release neutrons and millions of electron volts. There are prospects ultimately of converting this energy release directly into electricity without its passing through a steam cycle, he said.

Reactor Promising

Research at General Atomic's San Diego laboratory is aimed at maintaining and controlling the fusion of deuterium, Hallock continued. Resources already total $10 million, half provided by General Dynamics Corp and the rest by 11 Texas power companies.

More immediate economy in nuclear power generation is hoped for in a fission plant built around the advanced epithermal thorium reactor, said J. R. Welsh, Southwestern G&E Co. The $5 million research program, started last January by Southwest Atomic Energy Associates, has as its objective to plan a reactor producing 1,800-psi steam at 1,000F with reheat to 1,000F. The 6.8-ft-dia core will have a small amount of U 233 blanketed with thorium and is expected to generate 900 Mw of heat to drive a large steam turbine.

Capital savings from sparing use of graphite moderators and from selecting thorium as the fuel are anticipated and will cut the AETR plant's production cost to a level competitive with fossil-fuel plants, Welsh added. Design is based on the sodium-cooled, graphite-moderated reactor with which Atomics International produced 20 Mw of heat.

Recent changes in REA rulings, eliminating the co-op privilege of deferring interest payments and requiring amortization of loans to begin within three years, were hailed by W. W. Lynch, Texas P&L Co, as the first step toward putting co-ops on a mature basis.

Lynch advocated future withholding of G&T loans where power is available at reasonable rates from other sources, eliminating application of the preference clause to small groups of citizens, and encouraging co-ops to accept a fair share of the tax burden.

Kapp New Chairman

M. L. Kapp, Interstate Power Co's president, was elected chairman of the 1959 Southwest Power Conference, succeeding G. W. Evans, Kansas G&E president. Houston Lighting's Pres W. A. Parish will serve as vice-chairman and Arizona PS Vice Pres D. B. McGregor will remain as secretary-treasurer. The executive committee will consist of W. F. Lucking, Arizona PS; C. H. Whitmore, Iowa-Illinois G&E; E. P. Hennek, Western Light & Telephone; J. R. Welsh, Southwestern G&E; C. A. Semrad, St. Joseph L&P; G. A. Schreiber, PS of New Mexico; William Wolfe, Oklahoma G&E; and W. W. Lynch, Texas P&L.

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Readers Forum

Zinder Report Is Warning

To the Editor:

Your March 24, 1958 editorial "A Lesson in Unity: The Zinder Report" is quite timely, particularly when referenced to your December 16, 1957 article "Utilities Turn to Promotional Rates that Compete."

A few weeks ago I accompanied an insulation manufacturing representative and an electric house heating representative to the office of a well-known housing developer. The latter is constructing homes by the hundreds in the $16,000 to $20,000 class. The purpose of the visit was to interest the builder in constructing an all-electric home which would include electric space heating. It appeared as we waited for an audience with the builder that the job of putting over the all-electric home probably would be a push-over, since we noticed that the builder was using electric panel heat in his office suite.

Upon meeting the builder we explained that we had someone with hard cash who would buy an all-electric home if the house were properly insulated and wired for electric heat. The builder indicated that he was interested in anything new, but would not consider electric space heating in his development because while he enjoyed the luxury of this form of heating in his office it has proved too expensive. He reminded us that the power company offered no inducement for electric space heating since the best rate that the management could propose was the regular residential schedule (200 kwh for $6.80 with follow on step of 1.8 cents per kwh). In fact he indicated further that he was about to remove the existing electric heating system from his office suite and substitute gas.

At present the builder is equipping his homes with gas house heating, gas water heating, gas cooking, and gas clothes dryers—electricity is being used for lighting, refrigeration, and miscellaneous appliances. With "Whirlpool" ready to introduce its line of gas refrigerators in May, the newer homes may also be equipped with gas refrigerators. Such "all gas" housing offers pretty lean prospects for the "investor owned" electric utility to increase its average annual kilowatt-hour use per residential customer, unless as indicated in your article, the utility possibly may sponsor a promotional residential rate such as has been done by Arkansas Power and Light Company and Missouri Power and Light Company.

Perhaps the electric utility industry should thank AGA for its Zinder Report and the warning it offers concerning the positive need for a more aggressive outlook regarding promotional residential electric rates that compete. If heed is not given to this warning, it may be difficult to convince the man in competitive business to "Live Better—Electrically" and to keep him sold on the merits of the monopoly position of the "business managed" electric utility.

E. T. Hughes
750 North Dinwiddie Street
Arlington, Virginia

Check That Formula

To the Editor:

Thanks for the mention of the Grey Book and my voltage drop formulas on page 82 of the March 3 issue of ELECTRICAL WORLD. There is one thing wrong with the transcription of the formulas, however.

They should read $(21 \div A)$ instead of (21-A). Anyone trying to apply them in the incorrect form would run into difficulties.

Raymond A. Erwin, Chairman
Pacific Coast Subcommittee
American Institute of Electrical Engineers

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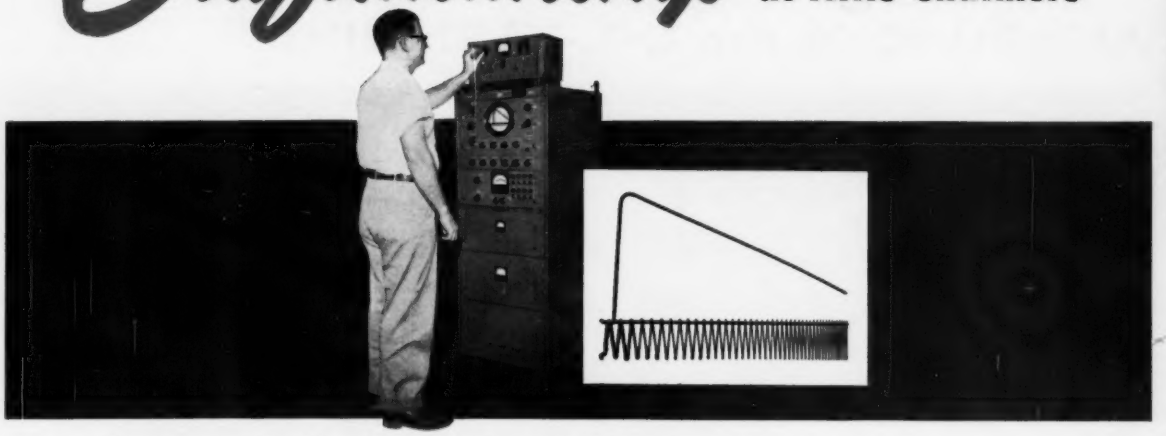

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